Department of Energy
Albuquerque Operations Office
Los Alamos Area Office
Los Alamos, New Mexico 87544

JUN 29 1994
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Mr. William Honker, Chief
RCRA Permits Branch
Hazardous Waste Management Division
U.S. EPA, Region 6
1445 Ross Ave., Suite 1200
Dallas, Texas 75202-2733

Dear Mr. Honker:

Enclosed are two copies of the final addendum to the RCRA Facility Investigation Workplan for OU 1129 at Los Alamos National Laboratories (LANL). The addendum has undergone LANL and Department of Energy (DOE) comment resolution and is submitted to the Environmental Protection Agency (EPA) for approval. The package includes the following items.

- Table 6-1 in Chapter 6, "AOCs and SWMUs Recommended for NFA at Decision Point 1." The table lists all the sites that are recommended for no further action (NFA). New sites proposed for NFA are printed in boldface type; those previously approved by the EPA are printed in italic type.

- Pages 7-1 through 7-17 in Chapter 7. These pages have been revised based on LANL and DOE comments after the Workplan was approved by EPA.

- Pages 7-129 through 7-199 in Chapter 7. These pages contain the sampling and analysis plans for Aggregates Q through Z.

As indicated by the copy list below, one copy each of this workplan addendum has been sent to the New Mexico Environment Department (NMED) and the NMED-AIP. The certification documentation is also attached.

If you have any questions, please call me or have your staff call Court Fesmire of my staff at (505) 665-4718.

Sincerely,

Theodore J. Taylor
Program Manager
Environmental Restoration Program

Enclosure

2724

JUN 29 1994

Bemto

cc w/enclosure:

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CERTIFICATION

I certify under penalty of law that this document 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:

"Addendum to the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1129 "

Name: _____ Date: June 23, 1994

Dennis J. Erickson, Director
Environment, Safety, and Health Division
Los Alamos National Laboratory

Name: _____ Date: 6/28/94

Joseph Vozella, Chief
Environmental Safety & Health Branch
Los Alamos Area Office - DOE

TABLE 6-1

AOCS AND SWMUS RECOMMENDED FOR NFA AT DECISION POINT 1

Boldface type—AOCs and SWMUs proposed for NFA as of March 31, 1994
Italic type—AOCs and SWMUs approved for NFA by the EPA as of November 3, 1993

AOC/SWMU	NFA Criteria				Description/Justification	References
	A	B	C	D		
C-4-001 Former Building Locations				•	Area of concern (AOC) No. C-4-001 consists of potential soil contamination beneath several former structures at Technical Area (TA) -4. TA-4-1, TA-4-2, and TA-4-8 were explosives magazines; TA-4-4 was used to store batteries; TA-4-5 was used as a storage building; TA-4-6 was used as a trimming building; and TA-4-13 is described as a hutment. These structures were built in 1945. TA-4-1 was demolished in 1985, and the other buildings were demolished in 1956. All the sites were monitored for radioactivity, and the surface was reclaimed during the Los Alamos Site Characterization Program (LASCP) decontamination and decommissioning (D&D) project in 1985. According to archival information, no known Resource Conservation and Recovery Act (RCRA) hazardous wastes or radioactive wastes were released to the environment at this site; therefore, this AOC is recommended for no further action (NFA).	LASL 1943–1993, 31437; Scholl 1989, 11740.
C-5-001 Former Building Locations				•	AOC NO. C-5-001 consists of two potential soil contamination areas associated with former TA-5-8 and TA-5-21. TA-5-8 was a storage building built adjacent to steel barricade Firing Pit No. 1 (TA-5-7) in 1944 and removed in 1950. Hazardous materials were not known to be stored in the building. Because it was located adjacent to the firing pit, the area of the building may have been contaminated with high explosives (HE) and depleted uranium. The site was decontaminated and decommissioned during the LASCP project in 1985. The site is included in the area to be studied during the Phase I sampling of SWMU No. 5-001(a) in Aggregate B, which is discussed in Section 7.6; therefore, a separate sampling program is unnecessary. This AOC is also addressed in the discussion of Aggregate R in Section 7.22. TA-5-21 was a maintenance building located west of the calibration chamber (TA-5-20). Its location suggests that the building was used to house equipment associated with work conducted in the calibration chamber. It was reported to be free of detectable radioactivity in 1976. According to archival information, no known RCRA hazardous materials were stored in TA-5-21, and it is recommended for NFA.	Blackwell 1976, 762; LASL 1943–1993, 31437.
5-006(a) Former Building Location				•	Solid waste management unit (SWMU) No. 5-006(a) is the site of TA-5-1. The building was used as a trim shack at TA-18 and was moved to TA-5 in 1948 or 1949 to be used as a laboratory. During an Industrial Hygiene Group survey in 1959, the building was found to be free of radioactive and toxic material contamination, but it was found to be contaminated with HE. The site and building were monitored in 1973 and found to be free of detectable radioactive contamination. The building was destroyed by fire sometime between 1973 and 1985. During the LASCP D&D project in 1985, the site was monitored with a Harshaw Model 301 Phoswich, and no radiological contamination was detected. The site was cleaned of surface debris left from the burning, recontoured, and reclaimed. On the basis of archival evidence, this SWMU is recommended for NFA.	Blackwell 1959, 760; LANL 1990, 7511; Martin 1973, 868; Scholl Fritz 1985, 891; Schulte 1959, 894.
5-006(d) Former Building Location				•	SWMU No. 5-006(d) is the site of a former laboratory (TA-5-6) built in 1944. In 1959 the building was found to be free of radioactive contamination and toxic materials, but it was found to be contaminated with HE. The building was burned. Surface debris was removed, and the site was recontoured in 1985. According to archival information, no known RCRA hazardous wastes or radioactive wastes were released to the environment; therefore, this SWMU is recommended for NFA.	Blackwell 1959, 760; LANL 1990, 7511; Schulte 1959, 894; Wingfield 1960, 915.

TABLE 6-1 (continued)

AOCs and SWMUs RECOMMENDED FOR NFA AT DECISION POINT 1

Boldface type—AOCs and SWMUs proposed for NFA as of March 31, 1994
Italic type—AOCs and SWMUs approved for NFA by the EPA as of November 3, 1993

AOC/SWMU	NFA Criteria A	B	C	D	Description/Justification	References
5-006(f) **5-006(g)** **Former Building Locations**				•	**SWMU Nos. 5-006(f and g) are the sites of former magazines TA-5-2 and TA-5-3. The buildings were built in 1945; they were burned in 1960 because they were found to be contaminated with HE. Miscellaneous building debris was removed during the D&D efforts of the LASCP project in 1985, and no radioactive contamination was found in the area. After the area was scanned using portable instruments, samples were collected, and depleted uranium was not found. Soil from TA-5-3 was then used to backfill the areas of TA-5-5, TA-5-7, TA-5-9, and TA-5-15. Soil from TA-5-2 was used to backfill TA-5-7, TA-5-9, and TA-5-15. After the areas were cleared of debris, they were contoured to existing terrain and reclaimed. According to archival information, no known RCRA hazardous wastes or radioactive wastes were released to the environment at this site; therefore, these SWMUs are recommended for NFA.**	**Dubois and Baytos 1972, 4867;** **LANL 1990, 7511;** **Wingfield 1960, 915.**
C-35-001 **C-35-002** **C-35-003** **Former UST Locations**	•	•			**AOC No. C-35-001, AOC No. C-35-002, and AOC No. C-35-003 are the sites of former underground storage tanks (USTs) that were used to store fuel oil. AOC No. C-35-001 (TA-35-18) was located north of the south wing of TA-35-2; AOC No. C-35-002 (TA-35-19) and AOC No. C-35-003 (TA-35-20) were located southeast of TA-35-2. The tanks were removed in 1988 and were reportedly in good condition. Contamination was not visible in the surrounding soils; however, soil samples were not collected when the tanks were excavated. According to archival information, no known source term or contaminants of concern (COCs) were released from the tanks; therefore, these AOCs are recommended for NFA.**	**LANL 1990, 7511;** **McInroy 1991, 21571.**
C-35-004 **Operational Release**	•			•	**AOC No. C-35-004 is the site of a 1000-gal. Shell Dela Oil spill south of TA-35-125 that discharged into Ten Site Canyon through the storm sewer in 1986. The spill reached the canyon and extended 30 ft downstream. Analyses of the oil indicated that the polychlorinated biphenyl (PCB) content was below the detection limit of 0.01mg/L. The spill was cleaned up using absorbent materials. This AOC is recommended for NFA because this was a one-time spill event, COCs were not found, and efforts have been made to clean up the spill.**	**Bohn 1986, 764;** **LANL 1990, 7511;** **LANL 1993, 31793;** **LANL 1993, 31794;** **LANL 1993, 31795;** **LANL 1993, 31796;** **Umphres 1986, 906.**
C-35-005 *C-35-006* *Operational Releases*	• •				*AOC No. C-35-005 is the site of a spill of 100 gal. of non-PCB-contaminated dielectric oil; AOC No. C-35-006 is the site of a spill of 5 gal. of organic waste solvent (see Section 3.3.2.1). Spills at these two sites were cleaned up immediately following the incidents (in 1986 and 1988, respectively). Trace amounts of the dielectric oil and organic waste solvent remained. These AOCs are recommended for NFA because they involved one-time spills that were immediately cleaned up and the amounts of spilled materials remaining after cleanup do not pose a threat to human health or the environment.*	*Bailey 1986, 757;* *LANL 1990, 7511.*
C-35-008 *Leaking PCB Transformer*		•	•	•	*AOC No. C-35-008 is the site of a leaking PCB transformer (PCB ID No. 5618) located in the basement of TA-35-2 (see Section 3.3.2.1). The oil/water mixture that leaked from the transformer was cleaned up under the Toxic Substance Control Act (TSCA). This AOC is recommended for NFA because site design and conditions preclude a potential release to the environment and the transformer has been removed.*	*LANL 1990, 7511.*
35-001 *Material Disposal Area W (MDA-W)*		•			*SWMU No. 35-001 consists of two 4-in.-diameter, 125-ft-long stainless steel tubes suspended vertically inside 8-in.-diameter carbon-steel-cased wells (see Section 3.3.2.1). Each tube, which is backfilled under pressure with nitrogen and is sealed, contains 150 L of liquid sodium reactor coolant contaminated with ^{239}Pu and associated fission products. Gross-gamma activity emitted from the site is monitored. Sodium and radionuclides cannot* *(continued on next page)*	*LANL circa 1981, 849;* *LASL 1977, 1761;* *Warren 1974, 910.*

TABLE 6-1 (continued)

AOCs AND SWMUs RECOMMENDED FOR NFA AT DECISION POINT 1

Boldface type—AOCs and SWMUs proposed for NFA as of March 31, 1994
Italic type—AOCs and SWMUs approved for NFA by the EPA as of November 3, 1993

AOC/SWMU	NFA Criteria A	B	C	D	Description/Justification	References
35-001 *Material Disposal Area W (MDA-W)* *(continued)*					*be released from the tubes unless the steel tubes are cracked. If the tubes were breached, the sodium would be expected to react explosively with moisture in the soil or tuff. However, because the tubes have not shown signs of cracking, no releases of sodium are believed to have occurred. Furthermore, potential contamination of the surrounding tuff cannot be assessed without drilling deep wells adjacent to the tubes. Such drilling activity would greatly increase the likelihood of breaching the containment tubes and could cause a potentially dangerous release.* *This SWMU is recommended for NFA because no evidence of a release exists; the engineered controls presently in place preclude any migration of contaminants to the environment; assessment and remediation options pose a greater threat to human health and the environment than not investigating the site; and this site is designated as an MDA-W, which will be maintained under perpetual institutional control.*	
35-002 *Material Disposal Area X (MDA-X)*				•	*SWMU No. 35-002, MDA-X, is the site of the Los Alamos Power Reactor Experiment No. 2 (LAPRE-II) reactor, which was buried in place after it was decommissioned in 1959 (see Section 3.3.2.1). This site was remediated in 1991 as an Environmental Restoration Interim Action (ERIA). This SWMU is recommended for NFA because all reactor-related equipment and contaminated soils were removed. Confirmatory soil sampling was conducted to verify the removal of all COCs including radionuclides and hazardous chemicals.*	*Fresquez 1991, 822;* *Montoya 1990, 877;* *Montoya 1991, 878;* *Montoya 1993, 31451;* *Roberson 1991, 21577;* *Waren 1974, 910.*
35-003(i) *Storage Tanks*	•				*SWMU No. 35-003(i) is the site of two steel surge tanks that were used to accommodate gas pressure excursions from the gas laser facility in TA-35-29 (see Section 3.3.2.1). Helium and nitrogen gases were the only substances handled by these tanks. In 1974 the tanks were moved from inside TA-35-27. (The surge tanks were never associated with the wastewater treatment plant, which is implied by their designation as a subunit of SWMU No. 35-003.) This SWMU is recommended for NFA because the tanks never handled RCRA hazardous wastes or radioactive wastes.*	*DOE 1987, 8663;* *DOE 1987, 8664;* *LASL 1943–1993, 31437.*
35-003(p) *Former Building Location*		•		•	*SWMU No. 35-003(p) is the site of the former air filter building (TA-35-7). This building was decontaminated and decommissioned in 1979 and 1980. The building housed air-filtering equipment for treating contaminated air from the original laboratory/office building (TA-35-2) that was completed in 1951. The removal of the building along with the material associated with the phase separator pit has been requested. This SWMU is recommended for NFA because the building previously underwent D&D activity, no evidence of a release exists following the 1980 D&D activity, and the building is currently scheduled for D&D and removal.*	*Hansen and Umphreys 1992, 21536;* *LANL circa 1981, 849.*
35-004(c) *Container Storage Area*		•			*SWMU No. 35-004(c) is an outdoor container storage area located on the south side of TA-35-125 (see Section 3.3.2.1). It is used to store drums of dielectric oil. The area is associated with the waste-oil treatment system (AOC No. 35-007) and is located in a covered, bermed area that is equipped with sumps and pumps for spill containment. Oil stains were observed within this bermed area, but the berm is designed to prevent spills from reaching the environment. This SWMU is recommended for NFA because site design precludes COCs from migrating to the environment.*	*LANL 1990, 7511;* *Roberson 1991, 21576.*

TABLE 6-1 (continued)

AOCs AND SWMUs RECOMMENDED FOR NFA AT DECISION POINT 1

Boldface type—AOCs and SWMUs proposed for NFA as of March 31, 1994
Italic type—AOCs and SWMUs approved for NFA by the EPA as of November 3, 1993

AOC/SWMU	NFA Criteria A	B	C	D	Description/Justification	References
35-004(d) *35-004(e)* *35-004(f)* *35-004(k)* *35-004(l)* *35-004(n)* *Container Storage Areas*		•			*SWMU Nos. 35-004(d and e) and AOC Nos. 35-004 (f, k, l, and n) are container storage areas located inside buildings throughout TA-35 (see Section 3.3.2.1). In August 1991 a site inspection revealed no evidence of spills. These SWMUs and AOCs are recommended for NFA because even if spills have occurred at these storage areas, site design precludes COCs from migrating to the environment. In addition, AOC No. 35-004(n) is a RCRA-permitted waste storage area.*	*LANL 1990, 7511;* *Roberson 1991, 21576.*
35-004(i) **Container Storage Area**		•			**AOC No. 35-004(i) is the site of an inactive container storage area, which is located west of TA-35-244, where oils, capacitors, solvents, and Freon have been stored. The paved area shows no evidence of spills or stains. It is not known if the asphalt was present when the area was used for storage. According to archival information, spills or releases did not occur; therefore, this AOC is recommended for NFA.**	**LANL 1990, 7511.**
35-004(j) **Container Storage Area**		•			**AOC No. 35-004(j) is an active container storage area, which is located on a loading dock on the southwest side of TA-35-128, where oils, capacitors, solvents, and Freon have been stored. Stained soils were noted during an Environmental Restoration (ER) Program site reconnaissance in 1988. Since then, the entire area around the south and west sides of TA-35-128 has been covered with asphalt, and the backfill material at the edge of the parking area has been covered with concrete. The asphalt isolates any present spills from the environment, and the asphalt and concrete prevent the infiltration of water into the surface where possible contamination may be present. This AOC is recommended for NFA because any contamination at the site is considered to be under institutional control.**	**LANL 1990, 7511;** **Koch 1994, 34769.**
35-004(o) **Container Storage Area**		•			**AOC No. 35-004(o) is a container storage area at the north dock of TA-35-213. Materials that have been stored in this area include solvents, chemicals, and Kimwipes. This container storage area is located on a concrete and asphalt pad inside a security fence. No evidence of staining or spills exists; therefore, this AOC is recommended for NFA.**	**LANL 1990, 7511.**
*35-005(a)** *35-005(b)** *35-006* *Inactive Surface Impoundments*				•	*AOC Nos. 35-005(a and b) are the sites of former gunite-lined waste-oil impoundments that were removed and closed in 1989 as Laboratory voluntary corrective actions (see Section 3.3.2.1). SWMU No. 35-006 is an unlined waste-oil impoundment that was replaced by AOC No. 35-005(a) in 1985. (Because SWMU No. 35-006 and AOC No. 35-005[a] occupied the same site, all remedial actions undertaken for AOC No. 35-005[a] also pertain to SWMU No. 35-006.) In 1989 the contents of both impoundments, the concrete liners, and contaminated soils were removed; and the excavated pits were backfilled following verbal approval of a closure plan by the New Mexico Environment Department (NMED). However, post-closure verification samples collected in 1990 revealed that above regulatory threshold concentrations of total petroleum hydrocarbons (TPH) were present in surface samples at AOC No. 35-005(a); and above regulatory threshold concentrations of volatile organic compounds (VOCs), TPH, and alpha activity were present in the subsurface at AOC No. 35-005(b). In January 1992 final closure reports for these sites were submitted to the Environmental Protection Agency (EPA) and the NMED. This SWMU and these AOCs are currently awaiting resolution of an NMED notice of deficiency regarding sampling sufficiency.*	*Fresquez 1990, 816;* *Fresquez 1991, 818;* *Fresquez 1991, 823;* *LANL 1991, 7678;* *LANL 1991, 7679.*

* Designated as a RCRA unit

TABLE 6-1 (continued)

AOCs AND SWMUs RECOMMENDED FOR NFA AT DECISION POINT 1

Boldface type—AOCs and SWMUs proposed for NFA as of March 31, 1994
Italic type—AOCs and SWMUs approved for NFA by the EPA as of November 3, 1993

AOC/SWMU	NFA Criteria				Description/Justification	References
	A	B	C	D		
35-007 *Waste-Oil Treatment System*	•	•			*AOC No. 35-007 is a closed-loop system used for reprocessing non-PCB dielectric oil, which is not a RCRA hazardous waste (see Section 3.3.2.1). The system is located within a curbed spill-retention area designed to contain oil spills. A container storage area (SWMU No. 35-004[c]) and a storage tank (AOC No. 35-011[c]) are also located inside this bermed area. This AOC is recommended for NFA because the materials managed are not hazardous wastes and site design precludes spilled oil from migrating to the environment.*	*LANL 1990, 7511;* *Roberson 1991, 21576.*
35-011(a) *Storage Tanks*		•			*SWMU No. 35-011(a) consists of two active aboveground fiberglass tanks located in the basement of TA-35-2 (see Section 3.3.2.1). The tanks receive potentially contaminated wastewater. The tanks and the surrounding floor were inspected in August 1991, and no evidence of spills was observed. If a spill were to occur, the wastewater would flow into the floor drains that are tied in to the sanitary waste lagoons east of TA-35 (SWMU No. 35-010). This SWMU is recommended for NFA because a direct release to the environment is precluded by containment within the basement or by diversion through floor drains to the sanitary-waste lagoons.*	*LANL 1990, 7511;* *Roberson 1991, 21578.*
*35-011(b)** *Underground Storage Tank*				•	*AOC No. 35-011(b) consists of an inactive UST (TA-35-159) that formerly stored contaminated waste dielectric oil, which may have contained PCBs and other COCs (see Section 3.3.2.1). The UST has been emptied and abandoned in place, and the ground above the tank has been covered with concrete; therefore, little potential for off-site migration of COCs currently exists. This AOC is scheduled to be investigated and remediated in accordance with NMED UST regulations. No further investigation is recommended as part of the Operable Unit (OU) 1129 RCRA Facility Investigation because the Laboratory must close the site to comply with state UST regulations.*	*McInroy 1992, 21572;* *Roberson 1991, 21576.*
*35-011(c)** *Storage Tanks*		•		•	*AOC No. 35-011(c) consists of an active UST (TA-35-197) and an aboveground tank. These tanks are associated with the oil-reprocessing facility (AOC No. 35-007) (see Section 3.3.2.1). Currently this system handles only non-PCB dielectric oil, but in the past the tanks may have received oils contaminated with water. The aboveground tank is located within a bermed area that precludes COCs from migrating to the environment. The UST was leak-tested in 1991 and found to be tight; therefore, it is assumed that the tank has not leaked in the past. This AOC is recommended for NFA because leakage from the UST is not suspected and site design precludes potential releases from the aboveground tank to the environment.*	*International Technology Corporation 1991, 21541;* *LANL 1990, 7511.*
*35-011(d)** *Underground Storage Tanks*				•	*AOC No. 35-011(d) is the site of two USTs (TA-35-TSL-188[1&2]) that were formerly used to store dielectric oils (see Section 3.3.2.1). The tanks were removed and inspected in 1991 and found to have no leaks. However, the area around the tanks is contaminated with oil because of leakage from an aboveground oil-handling facility formerly located at the area. That spill area is designated as SWMU No. 35-014(f). This AOC is recommended for NFA because the USTs have been removed, and it has been determined that they were not the source of the spilled oil. The oil-contaminated area, which includes the former UST locations, will be investigated as SWMU No. 35-014(f).*	*Carmichael 1991, 14618;* *McInroy 1991, 21571.*

* Designated as a RCRA unit

TABLE 6-1 (continued)

AOCs AND SWMUs RECOMMENDED FOR NFA AT DECISION POINT 1

Boldface type—AOCs and SWMUs proposed for NFA as of March 31, 1994
Italic type—AOCs and SWMUs approved for NFA by the EPA as of November 3, 1993

AOC/SWMU	NFA Criteria				Description/Justification	References
	A	B	C	D		
35-012(a) *Inactive Storage Tank*				•	*AOC No. 35-012(a) is the site of one UST (TA-35-158) that received materials such as dielectric oils and solvents from spills that occurred inside TA-35-85 (see Section 3.3.2.1). The tank was leak-tested before it was removed, and no leaks were found. The tank was removed in 1990 as a RCRA interim status closure, and the pit was backfilled and covered with asphalt. This AOC is recommended for NFA because remediation is complete, and the results of confirmatory sampling were submitted to the EPA and the NMED in the final closure report (estimated date of submittal was December 1, 1991).*	*McInroy 1991, 21571.*
35-012(b) *Inactive Storage Tanks*	•				*AOC No. 35-012(b) consists of two aboveground siege tanks (TA-35-278 and TA-35-279) located near the canyon edge southwest of TA-35-207. The tanks were installed but reportedly were never used. This AOC is recommended for NFA because the tanks were never used for the management of hazardous constituents.*	*Roberson 1991, 21576.*
35-013(a) *35-013(b)* *35-013(c)* *35-013(d)* *Sumps and Drains*	• 	• • • •			*SWMU Nos. 35-013(a through d) consist of several sumps, drains, and catch basins that are located within TA-35-2, TA-35-27, TA-35-85, and TA-35-213 (see Section 3.3.2.1). The sumps and drains receive contaminated sanitary and industrial wastewater. Catch basins included in SWMU No. 35-013(a) and one pair of floor drains included in SWMU No. 35-013(d) reportedly have never been used. Potential contamination cannot be adequately addressed without removing the floors, and no potential exists for this contamination to migrate to the environment. Any contamination beneath the buildings is considered to be under institutional control until the buildings undergo D&D. These SWMUs are recommended for NFA because site design precludes COCs from migrating to the environment.*	*LANL 1990, 7511;* *Roberson 1991, 21576.*
35-014(c) **Operational Release**	•	•			**SWMU No. 35-014(c) is a 10-ft-wide by 20-ft-long stained area observed on a sloping surface near the southeast corner of TA-35-29. This stained area may be the result of a past dielectric oil spill from nearby aboveground storage tanks. The tanks are labeled as PCB-free. In 1992 the site of SWMU No. 35-014(c) was excavated, backfilled, and covered with asphalt. This SWMU is recommended for NFA because it has not been used for the management of RCRA hazardous wastes.**	**LANL 1990, 7511.**
35-014(e_3) *Operational Release*		•			*SWMU No. 35-014(e_3) is the site of a dielectric oil spill located on the west side of TA-35-85 between TA-35-85 and TA-35-222. The site has since been covered with concrete and new construction (see Section 3.3.2.1). Because the concrete acts as a cap, essentially no mechanism exists for physically transporting potentially hazardous materials from the site. Contamination can be considered to be under institutional control until the buildings and concrete undergo D&D. This SWMU is recommended for NFA because site conditions and institutional controls preclude any releases that might pose a threat to human health or the environment.*	*LANL 1990, 7511;* *Roberson 1991, 21576.*
35-017 *Potential Soil Contamination*		•		•	*AOC No. 35-017 is the site of potential soil contamination from the operations of the Los Alamos Power Reactor Experiment No. 1 (LAPRE-I), LAPRE-II, and Los Alamos Molten Plutonium Reactor Experiment (LAMPRE) reactors. LAPRE-I and LAMPRE were operated in Cell J (Room 203) in the basement of TA-35-2. LAPRE-II was located in an underground steel-lined pit on the southeast exterior of TA-35-2. LAPRE-I was disassembled in 1956; LAMPRE was built in the same location in 1960. Portions of LAPRE-I were used in the construction of LAMPRE. Complete decommissioning of LAMPRE was accomplished in 1980. Documentation shows no* *(continued on next page)*	*H-Division 1957, 21532;* *Harper and Garde 1981, 6286;* *LANL 1990, 7511;* *Montoya 1993, 31451;* *Peterson 1959, 12000.*

TABLE 6-1 (continued)

AOCs AND SWMUs RECOMMENDED FOR NFA AT DECISION POINT 1

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AOC/SWMU	NFA Criteria				Description/Justification	References
	A	B	C	D		
35-017 *Potential Soil Contamination* *(continued)*					*evidence of releases or spills outside the reactor cell (Cell J). All areas associated with the operations of LAPRE-I and LAMPRE, except Cell J, have been released for unrestricted use; Cell J is considered to be under institutional control. LAPRE-II underwent D&D in 1991 and was released for unrestricted use in January 1992; the final D&D report was issued in February 1993. All contaminated soils at the LAPRE-II site were removed and disposed of at the radioactive waste disposal site (TA-54, Area G). After D&D was completed, Group EM-8 (now Group ESH-8) conducted confirmatory soil sampling. Results indicate that no COCs exist. This AOC is recommended for NFA.*	
35-018(b) **Leaking PCB Transformer**		•			**AOC No. 35-018(b) is a transformer (PCB ID No. 5547) located in the basement of TA-35-2. A leak from the transformer was discovered and cleaned up in 1985. This release was assessed to be a moderately active leak with no spill containment. Swipe samples taken from the concrete floor in the vicinity of the transformer after the spill cleanup contained up to 164 µg/100 cm² PCBs. It is believed that the transformer has had no releases outside the basement. This AOC is recommended for NFA because no pathways to the environment exist and the area is under institutional control.**	**Atencio 1985, 755.**
42-004 *(C-42-001)* *Canyon Disposal Site*				•	*SWMU No. 42-004, a canyon disposal site, was used for dumping building debris (see Section 3.4.2.1). (Note: SWMU No. 42-004 is the same as AOC No. C-42-001.) Soil samples collected and analyzed in 1991 as part of an ERIA contained gross-alpha, -beta, and -gamma at background levels. No VOCs, semivolatile organic compounds (SVOCs), or PCBs were detected. Toxicity characteristic leaching procedure (TCLP) metals (Ag, As, Ba, Cd, Cr, Hg, Pb, and Se) were below the regulatory levels in 40 CFR 261.24, Table 1.* *In July 1992 OU 1129 personnel collected samples at TA-42. None of the samples collected contained concentrations of COCs above screening action levels (SALs). In fact, all COCs were at least one order of magnitude below the SALs. On the basis of the D&D effort, the reconnaissance survey, and OU 1129 sampling, this SWMU is recommended for NFA because COCs are not present in concentrations that would pose a threat to human health or the environment.*	*Fresquez 1991, 817;* *Pratt 1993, 22213;* *Pratt 1993, 22214.*
48-002(c) **Container Storage Area**	•				**AOC No. 48-002(c) is the site of an inactive container storage area located east of TA-48-1 on an asphalt pad between TA-48-91 and the security fence. Drums, lead pigs, and batteries were stored here in 1988 and 1989. Archival information indicates that this area has had no releases or spills. Runoff from this AOC flows toward a proposed parking lot 30 ft due east. The proposed parking lot was sampled in 1991 by personnel from Group EM-8 (now Group ESH-8) for surface and subsurface contamination. The levels of all organic, inorganic, and radiological constituents were below EPA regulatory guidelines. According to archival information, spills or releases did not occur and sampling results were below EPA regulatory thresholds; therefore, this AOC is recommended for NFA.**	**Fresquez 1991, 819;** **LANL 1990, 7511.**
48-002(d) *Container Storage Area*		•			*AOC No. 48-002(d) is an active container storage area located on the northwest side of TA-48-1 that is currently used only for temporary storage of boxes of solid radioactive waste (see Section 3.5.2.1). A site inspection in 1991 revealed no visible evidence of past releases. This AOC is recommended for NFA because site conditions preclude COCs from migrating to the environment.*	*LANL 1990, 7511;* *Roberson 1991, 884.*

TABLE 6-1 (continued)

AOCs AND SWMUs RECOMMENDED FOR NFA AT DECISION POINT 1

Boldface type—AOCs and SWMUs proposed for NFA as of March 31, 1994
Italic type—AOCs and SWMUs approved for NFA by the EPA as of November 3, 1993

AOC/SWMU	NFA Criteria A	B	C	D	Description/Justification	References
48-004(a) *48-004(b)* *48-004(c)* *Sumps and Tanks*		•			*SWMU Nos. 48-004(a, b, and c) consist of several sumps and tanks that were abandoned in place in TA-48-1. The sumps and tanks are considered to be under institutional control. No mechanism for release of COCs to the environment can be determined. Archival information documents no spills or releases. The sumps and tanks have been inspected, and no physical evidence exists of releases or external contamination. These SWMUs are recommended for NFA because site design and conditions preclude COCs from migrating to the environment.*	*LANL 1990, 7511.*
48-004(d) *Tank*	•	•			*SWMU No. 48-004(d) is a small tank that was installed below the hot cell in the basement of TA-48-1 but has never been used (see Section 3.5.2.1). This SWMU is recommended for NFA because the tank was never used and site design and conditions preclude COCs from migrating to the environment.*	*LANL 1990, 7511;* *Roberson 1991, 884.*
48-006 *Active Septic System*	•				*AOC No. 48-006 is an active septic system that was installed in the early 1980s and has served only office buildings in which hazardous or radioactive materials have never been managed (see Section 3.5.2.1). This AOC is recommended for NFA because no contaminant source term exists and there is no reason to suspect releases of COCs from this septic system.*	*LANL 1990, 7511.*
48-007(e) **Outfall**	•				**SWMU No. 48-007(e), an outfall, was submitted to the EPA in May 1985 for inclusion under the National Pollutant Discharge Elimination System permit but was dropped from the permit in 1991. The outfall discharged a maximum of 500 gal./h as noncontact cooling water used to cool an electromagnet in the northwest corner of TA-48-8. The outfall has been used since 1984. The water discharged in the outfall was used for once-through cooling, and chemicals or solvents did not have access to the cooling water system. In 1991 samples were collected in the area to determine if COCs (including acetone, alcohol, and benzene) had been discharged. The analysis revealed background levels of gross-alpha, -beta, and -gamma and indicated that all TCLP metals were below the regulatory levels in 40 CFR 261.24. No SVOCs or PCB compounds were detected, but trace amounts (<52 ppb) of p-isopropyl toluene (p-Cymene), isopropylbenzene (cumene), and trichlorotrifluroethane (Freon) were detected in the samples collected. This SWMU is recommended for NFA because the outfall has not been used for the management of hazardous materials, which has been verified through sampling.**	**Chamberlin 1991, 31452;** **Fresquez 1991, 820;** **Fresquez 1991, 821;** **LANL 1990, 7511;** **LANL 1991, 21556.**
48-008 *Leaking PCB Transformers*	•	•			*AOC No. 48-008 consists of two PCB transformers that are located inside the basement of TA-48-1 (see Section 3.5.2.1). Oil that leaked from these transformers was cleaned up in accordance with TSCA guidelines, and no visible signs of oil stains were observed during a site inspection in July 1991. This AOC is recommended for NFA because site design and conditions preclude a potential release to the environment and the leakage represents a nonsystematic release that was immediately cleaned up.*	*LANL 1990, 7511;* *Roberson 1991, 884.*
48-009 **Soil Contamination**	•				**AOC No. 48-009 is the site of two air compressors located on a loading dock east of TA-48-1. Since 1989 the main compressor has periodically broken down and sprayed crankcase oil on the ground. The oil was sampled in 1989 and does not contain PCBs. This AOC is recommended for NFA because it has never been used for the management of RCRA hazardous wastes or radioactive wastes.**	**LANL 1990, 7511.**

TABLE 6-1 (continued)

AOCs AND SWMUs RECOMMENDED FOR NFA AT DECISION POINT 1

Boldface type—AOCs and SWMUs proposed for NFA as of March 31, 1994
Italic type—AOCs and SWMUs approved for NFA by the EPA as of November 3, 1993

AOC/SWMU	NFA Criteria A	B	C	D	Description/Justification	References
C-52-001 **C-52-002** **Potential Soil Contamination**		•			**AOC No. C-52-001 and AOC No. C-52-002 are sites of possible soil contamination from TA-52-9, which is located on the north side of the Ultra-High-Temperature Reactor Experiment (UHTREX) (TA-52-1). In the past, dielectric oil stains have been observed on a transformer pad, and the transformers present at the site in June 1992 are labeled as containing PCBs. These transformers are situated on a concrete pad that is surrounded by asphalt. These AOCs are recommended for NFA because at present no stains or evidence of leakage from the transformers exist. The transformers are scheduled for removal, and samples of PCBs will be collected from the soils beneath the transformers.**	**LANL 1990, 7511.**
52-001(a) *Filter Pit* *52-001(b)* *Heat Dump Building* *52-001(c)* *Heat Dump Pad*				• • •	*SWMU Nos. 52-001(a through c) consist of equipment that was associated with the filter and cooling systems of the UHTREX reactor (see Section 3.6.2.1). These sites underwent D&D in 1989 and were decontaminated to levels below DOE guidelines for radioactivity. No process-related source for nonradioactive hazardous constituents exists at these sites; therefore, no hazardous contaminant source term exists. These SWMUs are recommended for NFA because the sites have undergone remediation and COCs are not present at levels that pose a threat to human health or the environment.*	*Elder 1991, 2665;* *Salazar and Elder 1992, 12021;* *Soholt 1988, 901.*
52-001(d) *Sump Pump Room, Hot Cells, Duct Work*		•		•	*SWMU No. 52-001(d) is the site of contaminated equipment inside TA-52-1 that was associated with the UHTREX reactor (see Sections 3.6.2.1 and 3.6.2.4). The contaminated equipment was removed in 1989, and the building was decontaminated to levels below DOE guidelines for radioactivity. This SWMU is recommended for NFA because the site has undergone remediation and COCs are not present at levels that pose a threat to human health or the environment. In addition, site conditions preclude a release of COCs to the environment.*	*Elder 1991, 2665;* *Salazar and Elder 1992, 12021;* *Soholt 1988, 901.*
52-002(b) *52-002(f)* *Active Septic Systems*	• •				*SWMU Nos. 52-002(b and f) are active septic systems that were installed in the early 1980s and have served only office buildings in which hazardous or radioactive materials have never been managed (see Section 3.6.2.1). These SWMUs are recommended for NFA because no contaminant source term exists and there is no reason to suspect releases of COCs from these septic systems.*	*LANL 1990, 7511;* *Smithour 1991, 21581.*
52-002(c) *52-002(d)* *Septic Systems*	• •				*SWMU Nos. 52-002(c and d) represent septic systems that apparently were planned but never constructed (see Section 3.6.2.1). These SWMUs are recommended for NFA because the septic systems do not exist and were never used for the management of hazardous or radioactive materials.*	*LANL 1990, 7511;* *Smithour 1991, 21581.*
52-002(g) *Holding Tank*	•				*SWMU No. 52-002(g) is not an active septic system as designated in the 1990 SWMU report but simply a sewage holding tank that was installed in 1989 or 1990 (see Section 3.6.2.1). The holding tank serves offices in a new building in which hazardous and radioactive materials have never been managed. This SWMU is recommended for NFA because it has never been used for the management of hazardous or radioactive materials.*	*Smithour 1991, 21581.*
52-003(b) *Industrial Wastelines*				•	*SWMU No. 52-003(b) is the site of two 3-in.-diameter cast-iron industrial wastelines (lines 65 and 66) that transported liquid wastes from the UHTREX reactor to a waste-treatment facility (SWMU No. 52-003[a]) and then to TA-50 (see Section 3.6.2.1). These wastelines were removed in 1988 during the UHTREX D&D project, and 173 soil samples were collected at 2-ft intervals along the route of the wastelines. Sample depths ranged from 5 ft to 7 ft. Beta activity was nondetectable, alpha and gamma activity were far below the site-specific RESRAD computer code model, all metals were within background levels, and organics were below detection limits. This SWMU is recommended for NFA because the site has undergone D&D and confirmatory sampling indicates that COCs are not present in concentrations that exceed natural background levels.*	*Elder 1991, 2665;* *LANL 1990, 7511;* *Salazar and Elder 1992, 12021;* *Soholt 1988, 901.*

TABLE 6-1 (continued)

AOCs AND SWMUs RECOMMENDED FOR NFA AT DECISION POINT 1

Boldface type—AOCs and SWMUs proposed for NFA as of March 31, 1994
Italic type—AOCs and SWMUs approved for NFA by the EPA as of November 3, 1993

AOC/SWMU	NFA Criteria A	B	C	D	Description/Justification	References
52-004 *Inactive Outfall*	•				*SWMU No. 52-004 is an inactive outfall from which only noncontact cooling water associated with a simulated fuel rod cooling process was discharged (see Section 3.6.2.1). A radiological survey conducted in the area of the outfall during a 1988 ER Program site reconnaissance did not detect levels above background. This SWMU is recommended for NFA because the outfall was never used for the management of hazardous or radioactive materials.*	*DOE 1987, 8663; DOE 1987, 8664; LANL 1990, 7511; Roberson 1991, 7405.*
55-001 *Cementing Process* *55-004* *Evaporator* *55-005* *Filtration Unit*		• • •			*AOC No. 55-001, AOC No. 55-004, and AOC No. 55-005 consist of a cementing process, an evaporator, and a filtration unit, which are situated together inside a series of negative-pressure glove boxes in TA-55-4 (see Section 3.7.2.1). The AOCs are part of the TA-55 waste minimization process that operates under RCRA Mixed-Waste Interim Status. These AOCs are recommended for NFA because site design precludes a release of hazardous materials to the environment and the AOCs are part of a process permitted under RCRA Mixed-Waste Interim Status at the Laboratory.*	*LANL 1990, 7511; Roberson 1991, 883.*
55-002(a) *55-002(b)* *Radioactive Waste Container Storage Areas*		• •			*AOC Nos. 55-002(a and b) are container storage areas for radioactive solid waste (see Section 3.7.2.1). AOC No. 55-002(a) consists of several separate storage areas located inside TA-55-4; AOC No. 55-002(b) includes dumpsters outside TA-55-4 that are used only for temporary storage of radioactively contaminated solid waste. These AOCs are recommended for NFA because site design and conditions preclude a release of COCs to the environment.*	*LANL 1990, 7511; Roberson 1991, 883.*
55-002(c) **Container Storage Area**		•			**AOC No. 55-002(c) is an outdoor waste container storage area (asphalt pad) located on the west side of TA-55-4. This area is an interim storage area for wooden crates containing radioactive and mixed waste that are awaiting transport to TA-54 (see Section 3.7.2.1). This AOC is recommended for NFA because there is no evidence that any RCRA wastes have been released at this site.**	**Pratt 1994, 34768.**
55-003 *Storage Tank and Containment Area*	•	•			*AOC No. 55-003 consists of an aboveground storage tank and the surrounding containment structure (see Section 3.7.2.1). Currently the tank is used to store pure nitric acid, which is a product not a waste. The surrounding secondary containment structure is capable of holding the contents of the entire tank and is designed to prevent a release of hazardous materials to the environment. This AOC is recommended for NFA because the tank is not used to store hazardous waste and site design precludes a release to the environment.*	*LANL 1990, 7511; Roberson 1991, 883.*
55-006 *Glass Breaker*		•			*AOC No. 55-006 is a glass breaker designed to break radionuclide-contaminated glassware (see Section 3.7.2.1). The unit is located within a glove box in TA-55-4. This AOC is recommended for NFA because site design precludes a release to the environment.*	*Kaal 1991, 844; LANL 1990, 7511.*
55-007 *Thermal Combustion Units*		•			*AOC No. 55-007 consists of two currently inactive thermal combustion units that are located inside glove boxes in TA-55-4 (see Section 3.7.2.1). The units are now awaiting a RCRA mixed-waste operating permit. The units are designed so that emissions are passed through scrubbing solutions and high-efficiency particulate air filters. This AOC is recommended for NFA because site design precludes releases of hazardous materials to the environment and the units will not be operational until the appropriate RCRA permits are obtained.*	*Roberson 1991, 883.*

TABLE 6-1 (concluded)

AOCS AND SWMUS RECOMMENDED FOR NFA AT DECISION POINT 1

Boldface type—AOCs and SWMUs proposed for NFA as of March 31, 1994
Italic **type—AOCs and SWMUs approved for NFA by the EPA as of November 3, 1993**

AOC/SWMU	NFA Criteria A	B	C	D	Description/Justification	References
55-008 *Sumps and Tanks*		•			*SWMU No. 55-008 consists of several sumps and tanks that are located in the basement of TA-55-4 (see Section 3.7.2.1). If COCs have seeped through the floors of the building, contamination cannot be adequately addressed without removing the floors, and no potential exists for this contamination to migrate. Any contamination beneath the building is considered to be under institutional control and will be addressed when the building undergoes D&D. This SWMU is recommended for NFA because even if primary releases from the sumps and tanks would occur, site design would preclude COCs from migrating to the environment.*	*LANL 1990, 7511;* *Roberson 1991, 883.*
55-009 *Sump*	•				*SWMU No. 55-009 is an inactive monitoring sump located outside TA-55-6 (see Section 3.7.2.1). The sump was used to monitor sanitary waste liquids from TA-55 for radioactivity before they are discharged to the TA-35 sewage treatment lagoons. Radioactivity was never detected, but the waste stream may have contained small quantities of hazardous wastes. The sump is no longer used and has been abandoned in place. This SWMU is recommended for NFA because hazardous wastes were not generated, treated, stored, or disposed of at the site and radioactivity was never detected in the waste stream.*	*LANL 1990, 7511;* *Roberson 1991, 883.*
55-010 **Solvent Spill**		•			**AOC No. 55-010 is the site of a one-time spill of solvent that contained methyl ethyl ketone with smaller quantities of toluene and methyl isobutyl ketone. The mixture was an organic solvent for plasite paint. During the construction of the basement of TA-55-4, the painting contractor for TA-55 cleaned painting materials in the area. The area was backfilled with approximately 18 ft of fill and capped with asphalt after TA-55-4 was completed. This AOC is recommended for NFA because the spill was a one-time event and site design precludes releases that would pose a threat to human health or the environment.**	**LANL 1990, 7511;** **Roy F. Weston, Inc. 1989, 11907;** **Schmidt 1984, 893.**
55-012 **Inactive Hazardous Waste Container Storage Area**		•			**AOC No. 55-012 is the site of a bottle containing waste acid and heavy metals that was stored on a shelf in a laborstory in TA-55-4 (see Section 3.7.2.1). The bottle was removed and the contents disposed of before a site visit in November 1990. This AOC is recommended for NFA because there is no evidence that any RCRA wastes have been released at this site.**	**LANL 1990, 7511.**
55-013(a) *55-013(b)* *Hazardous Waste Container Storage Areas*		• •			*AOC Nos. 55-013(a and b) consist of two active hazardous waste container storage areas (see Section 3.7.2.1). For health and safety reasons, containers of hazardous chemicals (that is, products not waste materials) are located under fume hoods. The storage areas are located in TA-55-3 and TA-55-4. These AOCs are recommended for NFA because site design and conditions preclude a release that would pose a threat to human health or the environment.*	*LANL 1990, 7511;* *Roberson 1991, 883.*
63-002 **Container Storage Area**		•			**AOC No. 63-002 is a container storage area in a fenced yard that is east of the north parking lot at TA-63. During a 1991 ER Program inspection, several drums of solvent were observed in the bermed part of the storage area (see Section 3.8.2.1). No staining or traces of waste were observed during a site visit in 1992. This AOC is recommended for NFA because there is no reason to believe that any RCRA wastes have been released; additionally, site design precludes spills from migrating to the environment.**	**Roberson 1991, 7405.**

7.0 SAMPLING AND ANALYSIS PLANS

The Phase I sampling and analysis plans (SAPs) in this chapter have been designed to confirm the presence or absence of contamination at Operable Unit (OU) 1129. Confirmation of the presence or absence of contamination involves identifying the present location of waste streams from waste discharge sources and the types and concentrations of contaminants of concern (COCs). Data collected from Phase I may be used to make a determination of no further action (NFA) or to design the Phase II SAP. After the Phase I investigation has been conducted at each aggregate, Phase II SAPs will be developed to define the complete nature and extent in accordance with the Phase II data quality objectives (DQOs). As outlined in Chapter 5.0 of this Work Plan, Phase II will follow directly after Phase I whenever possible (as funding permits) to make better use of sampling personnel and equipment and to shorten the overall Resource Conservation and Recovery Act (RCRA) facility investigation time line.

The OU 1129 SAPs have been developed on the basis of information presented previously in this Work Plan. Refer to Chapter 3.0 for a summary of the archival information for each solid waste management unit (SWMU), Chapter 4.0 for the OU 1129 conceptual model, and Chapter 5.0 for a discussion of the DQOs for OU 1129. Figure 7-1 is a political boundary map of the area surrounding OU 1129. See also Attachment I in Chapter 2.0 for SWMU locations. Table 7-1 lists each SWMU or area of concern (AOC) with its corresponding figure numbers, technical area (TA), and aggregate. (Note: Figures and tables for each aggregate are located at the end of each section of this chapter.)

The SAPs in this Work Plan have been written to address all Hazardous and Solid Waste Amendments (HSWA) Module SWMUs plus associated non-HSWA Module SWMUs and AOCs at OU 1129 (see Chapter 1.0 for a discussion of HSWA Module SWMUs). Table 7-2 lists those HSWA Module SWMUs, non-HSWA Module SWMUs, and AOCs that have been incorporated into SWMU aggregates for the purpose of SAP development. Sections 7.1 through 7.4 highlight the methods and the approach used in designing the SAPs in Sections 7.5 through 7.30, which present Phase I SAPs for SWMU Aggregates A through Z at OU 1129.

7.1 Modeling in OU 1129 Sampling Plan Development

A large number of SWMUs and AOCs within OU 1129 do not have available documentation on the extent of COCs in the subsurface environment. These sampling plans are designed to collect initial data at points considered most likely to yield a "hit" if residual contamination exists. To support the decisions of where to sample first and to what depths, the use of several models and modeling techniques was employed to aid in developing a general sampling plan.

The use of modeling at this stage of sampling plan development had four principal goals.

1) Develop a conceptual picture of potential worst-case contaminant migration within the two predominant soil regimes. This should help in picking appropriate minimum sampling depths.

2) Help define sampling plans in areas in which decontamination and decommissioning (D&D) or other removal activities had provided some sampling data. This should allow the first sampling to intersect zones of highest predicted concentrations.

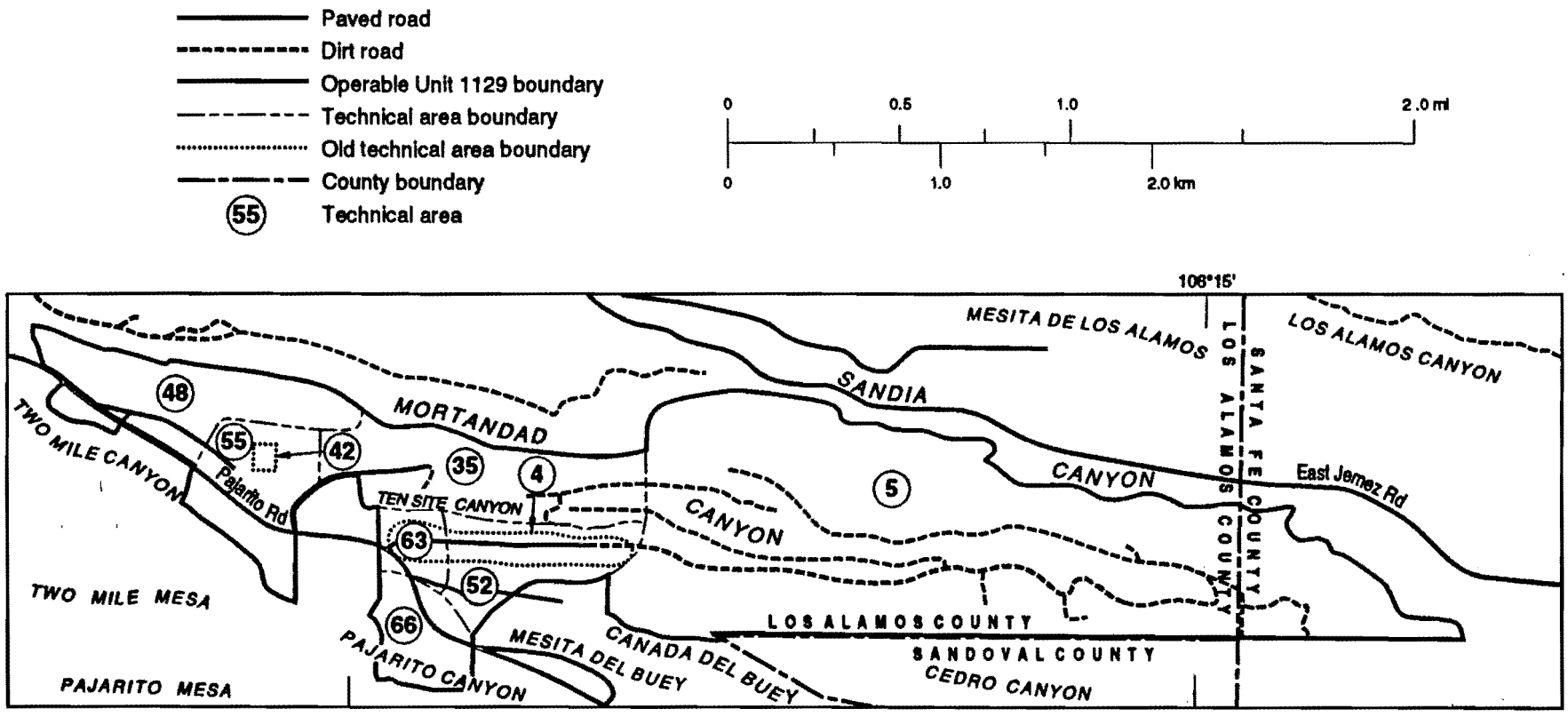


Figure 7-1. Location of technical areas at OU 1129.

TABLE 7-1

SWMUs AND AOCs WITH CORRESPONDING FIGURE NUMBERS, TECHNICAL AREA, AND AGGREGATE

SWMUs and AOCs	Figure Numbers	Technical Area	Aggregate
4-001	7-4, 7-45	Former TA-4	A
4-002	7-4	Former TA-4	A
4-003(a)	7-44	Former TA-4	Q
4-003(b)	7-45	Former TA-4	Q
4-004	7-44	Former TA-4	Q
5-001(a)	7-6, 7-47, 7-49	TA-5	B
5-001(b)	7-6, 7-47, 7-49	TA-5	B
5-001(c)	7-49	TA-5	R
5-002	7-6	TA-5	B
5-004	7-8	TA-5	C
5-005(a)	7-9	TA-5	C
5-005(b)	7-50	TA-5	R
5-006 (b)	7-47	TA-5	R
5-006(c)	7-50	TA-5	R
5-006 (e)	7-47	TA-5	R
5-006 (h)	7-47	TA-5	R
35-003(a)	7-12	TA-35 East	D
35-003(b)	7-12	TA-35 East	D
35-003(c)	7-12	TA-35 East	D
35-003(d)	7-13	TA-35 East	D
35-003(e)	7-14	TA-35 East	D
35-003(f)	7-14	TA-35 East	D
35-003(g)	7-14	TA-35 East	D
35-003(h)	7-15	TA-35 East	D
35-003(j)	7-28	TA-35 East	I
35-003(k)	7-28	TA-35 East	I
35-003(l)	7-13	TA-35 East	D
35-003(m)	7-14	TA-35 East	D
35-003(misc)	7-15	TA-35 East	D
35-003(n)	7-12	TA-35 East	D
35-003(o)	7-14	TA-35 East	D
35-003(q)	7-13	TA-35 East	D
35-003(r)	7-16	TA-35 East	D
35-004(a)	7-54	TA-35 East	T
35-004(b)	7-56	TA-35 West	U
35-004(g)	7-54	TA-35 East	T
35-004(h)	7-54	TA-35 East	T
35-004(m)	7-59	TA-35 West	V
35-008	7-17	TA-35 West	E
35-009(a)	7-19	TA-35 East	F
35-009(b)	7-20	TA-35 East	F
35-009(c)	7-21	TA-35 East	F
35-009(d)	7-22	TA-35 East	F
35-009(e)	7-54	TA-35 East	T
35-010(a)	7-24	TA-35 East	G
35-010(b)	7-24	TA-35 East	G
35-010(c)	7-24	TA-35 East	G
35-010(d)	7-62	TA-35 East	W
35-010(e)	7-62	TA-35 East	W
35-014(a)	7-26	TA-35- East	H
35-014(b)	7-26	TA-35- East	H
35-014(d)	7-28	TA-35 East	I
35-014(e1)	7-17, 7-56	TA-35 West	U
35-014(e2)	7-56	TA-35 West	U

TABLE 7-1 (continued)

SWMUs AND AOCs WITH CORRESPONDING FIGURE NUMBERS, TECHNICAL AREA, AND AGGREGATE

SWMUs and AOCs	Figure Numbers	Technical Area	Aggregate
35-014(f)	7-56	TA-35 West	U
35-014(g1)	7-59	TA-35 West	V
35-014(g2)	7-59	TA-35 West	V
35-014(g3)	7-59	TA-35 West	V
35-015(a)	7-59	TA-35 West	V
35-015(b)	7-28	TA-35 East	I
35-016(a)	7-54	TA-35 East	T
35-016(b)	7-59	TA-35 West	V
35-016(c)	7-54	TA-35 East	T
35-016(d)	7-54	TA-35 East	T
35-016(e)	7-56	TA-35 West	U
35-016(f)	7-56	TA-35 West	U
35-016(g)	7-57	TA-35 West	U
35-016(h)	7-56, 7-57	TA-35 West	U
35-016(i)	7-56	TA-35 West	U
35-016(j)	7-59	TA-35 West	V
35-016(k)	7-54	TA-35 East	T
35-016(l)	7-54	TA-35 East	T
35-016(m)	7-52	TA-35 East	S
35-016(n)	7-59	TA-35 West	V
35-016(o)	7-52	TA-35 East	S
35-016(p)	7-52	TA-35 East	S
35-016(q)	7-54	TA-35 East	T
35-018(a)	7-60	TA-35 East	V
42-001(a)	Appendix E	Former TA-42	J
42-001(b)	Appendix E	Former TA-42	J
42-001(c)	Appendix E	Former TA-42	J
42-002(a)	Appendix E	Former TA-42	J
42-002(b)	Appendix E	Former TA-42	J
42-003	Appendix E	Former TA-42	J
48-001	7-30	TA-48	K
48-002(a)	7-34	TA-48	L
48-002(b)	7-34	TA-48	L
48-002(e)	7-65	TA-48	X
48-003	7-36	TA-48	M
48-005	7-38	TA-48	N
48-007(a)	7-30, 7-65	TA-48	X
48-007(b)	7-67	TA-48	Y
48-007(c)	7-67	TA-48	Y
48-007(d)	7-65	TA-48	X
48-007(f)	7-67	TA-48	Y
48-010	7-65	TA-48	X
52-002(a)	7-40	TA-52	O
52-003(a)	7-40	TA-52	O
55-011(a)	7-69	TA-55	Z
55-011(b)	7-69	TA-55	Z
55-011(c)	7-69	TA-55	Z
55-011(d)	7-69	TA-55	Z
55-011(e)	7-69	TA-55	Z
63-001(a)	7-42	TA-63	P
63-001(b)	7-42	TA-63	P
C-35-007	7-63	TA-35 East	W
C-5-001	7-8, 7-47, 7-49	TA-5	R

TABLE 7-2

LISTING OF HSWA MODULE AND NON-HSWA MODULE PHASE I SAPs FOR OU 1129

SAP Subsection	SWMU Aggregate	HSWA SWMUs	Non-HSWA SWMUs and AOCs
7.5	A	4-001 and 4-002	
7.6	B	5-001(a and b) and 5-002	
7.7	C	5-004 and 5-005(a)	
7.8	D	35-003(a–h, l–o, and q)	35-003(r) and 35-003(misc.)
7.9	E	35-008	
7.10	F	35-009(a–d)	
7.11	G	35-010(a–c)	
7.12	H	35-014(a and b)	
7.13	I	35-003(j and k) and 35-015(b)	35-014(d)
Appendix E	J	42-001(a–c), 42-002(b), and 42-003	42-002(a)
7.15	K		48-001
7.16	L	48-002(a and b)	
7.17	M	48-003	
7.18	N	48-005	
7.19	O	52-002(a) and 52-003(a)	
7.20	P	63-001(a and b)	
7.21	Q	4-003(a and b)	4-004
7.22	R	5-005(b) and 5 -006(b, c, e, and h)	5-001(c) and C-5-001
7.23	S	35-016(m, o, and p)	
7.24	T	35-004(a, g, and h); 35-009(e); and 35-016(a, c, d, k, and q)	35-016(l)
7.25	U	35-004(b); 35-014(e_1 and e_2); and 35-016(i)	35-014(f) and 35-016(e–h)
7.26	V	35-014(g_1, g_2, and g_3) and 35-015(a)	35-004(m); 35 -016(b, j, and n); and 35-018(a)
7.27	W	35-010(d)	35-010(e) and C-35-007
7.28	X	48-007(a and d) and 48-010	48-002(e)
7.29	Y	48-007(b, c, and f)	
7.30	Z		55-011(a–e)

3) Predict depositional concentration locations from available monitoring data for stack emissions of radionuclides. This should also allow the first sampling to intersect zones of highest predicted concentrations.

4) Provide some initial estimate of the behavior of radionuclides in an environment containing organic wastes. This should indicate whether radionuclides were confined to the upper soil layers or had a greater migration potential.

To support the first goal, three scenarios were created involving direct discharge of liquid effluent or chemicals to the soil. Modeling for goals two and three used existing data and real-world meteorology. The aqueous speciation and mobility of a common radionuclide, ^{90}Sr, were examined at various pH and concentration levels in the presence of an organic ligand to satisfy the fourth goal. The results of this modeling effort are summarized in the following text.

7.1.1 Choice of Models and Constraints

The SWMUs of OU 1129 are located principally on a mesa top and in small canyon drainages off the mesa top. Because the depth to the principal aquifer in OU 1129 is several hundred meters, a model for examining vertical transport of contaminants within the vadose zone only was chosen for ground-level liquid effluent. The Environmental Protection Agency (EPA)-sponsored personal computer graphical exposure modeling system (PCGEMS) (General Sciences Corporation 1990, 31274) was chosen for the modeling effort because it comes packaged with a database of EPA-listed organics and their chemical attributes and contains the SESOIL-84 unsaturated zone model. SESOIL is a seasonal soil compartment model that estimates the rate of vertical chemical transport and transformation in the soil column in terms of mass and concentration distributions among the soil, water, and air phases in the unsaturated zone. The soil column is defined as the compartment that extends from the soil surface through the unsaturated zone to the groundwater table (General Sciences Corporation 1990, 31274). The structure of PCGEMS dictated that organic pollutants be used for model transport estimation.

For the modeling of air emissions, the EPA-sponsored AIRDOS-EPA computer code was used. This code calculates the dispersion of airborne concentrations of radionuclides from constant point sources. In addition to air dispersion, AIRDOS considers the effects of radioactive decay, dry deposition, gravitational settling, and precipitation scavenging. For this exercise the code was used for calculating cumulative surface deposition for historical stack releases. The depositional information was then used as input for a second computer code, SURFER, which was used to krige the results to produce an isoplethic map of the depositional pattern. The AIRDOS concentrations that were calculated to be present on the soil due to atmospheric deposition (fallout) were not used as sources for further PCGEMS modeling of contaminant transport in the vadose zone. Surface and near-surface sampling locations for stack-emission SWMUs are biased toward the areas of highest predicted deposition.

Data from sampling events associated with the removal of contaminated facilities were evaluated. The data were then modeled with SURFER to predict zones of highest concentration, thus focusing the sampling plans for some areas. This approach was implemented in the area just east of TA-35-7. The results of this effort are shown in the sampling plan for Aggregate D, SWMU Nos. 35-003(a through q).

7.1.2 Summary of Vadose Zone Modeling

Three scenarios were developed on the basis of known waste streams and process history within OU 1129. Scenarios 1 and 2 are identical except for the pollutant and involve the hypothetical spill of a 55-gal. drum of an industrial organic compound. The spill is a one-time event that covers an area of 25 m^2. For Scenario 1, benzene (RCRA waste U019), a light nonaqueous phase liquid (LNAPL), was chosen as an indicator of behavior for many of the industrial solvents potentially present in SWMUs in OU 1129. For Scenario 2, the pollutant chosen was the dense nonaqueous phase liquid (DNAPL), 1,1,2,2 tetrachloroethane (RCRA waste U208). This compound was chosen because it is roughly analogous to other DNAPLs likely to be encountered at OU 1129, including polychlorinated biphenyl (PCB)-contaminated dielectric oils.

In creating Scenarios 1 and 2, this spill was considered likely to occur only on the mesa top at TA-35. For this reason, the local Hackroy soil type was used as the top layer in the SESOIL column. The Bandelier Tuff was considered to underlay the Hackroy soils. Physical parameters for the soil were taken from the Los Alamos soil survey (Nyhan et al. 1978, 5702). (The soils map for OU 1129 may be found in Appendix C, Figure C-1.) Because of the diversity of numbers published about the Bandelier Tuff, parameters were taken from the published modeling efforts of Travis and Trent (Travis and Trent 1991, 7658) and Travis and Nuttall (Travis and Nuttall 1985, 7227). For all three scenarios, the local climatological summary contained in the 1989 environmental surveillance report (ESG 1990, 6995) was used to allow the SESOIL code to calculate evapotranspiration rates.

Scenario 3 is an attempt to estimate the migration potential of a low-level waste discharged continually into the Totavi soils of Ten Site Canyon. This scenario used the approximate discharge volume of the old TA-35 wastewater treatment plant with an assumed concentration of 0.1% of a DNAPL. A DNAPL was chosen because of the potential radionuclide transport with anionic organic ligands (Section 7.1.6).

To develop a maximum or bounding condition of potential migration in all scenarios, the total pollutant load was assumed to have been transmitted into the soil column. No reduction of load through volatilization, runoff, or other process was allowed. The K_d, or soil sorption coefficient, was assumed to be zero, and no cation-exchange capacity was assumed to exist within the soil layers. The summary of the results of the SESOIL models is graphed in Figure 7-2. The specific input parameters for the various model components are listed in Appendix C.

7.1.3 Results of Vadose Zone Scenarios 1 and 2

Scenario 1 simulated the spill of 55 gal. of benzene on the Hackroy soil type on the TA-35 mesa top. The soil column consisted of three layers. The top two layers comprised 8 cm of a sandy loam above 22 cm of a clay loam, all underlain by the Bandelier Tuff. The SESOIL model predicted that a maximum pollutant depth of about 3.3 m would occur after a dozen years (see Figure 7-2).

In contrast, Scenario 2 involved a DNAPL but kept all other parameters the same as Scenario 1. The SESOIL results indicate that a maximum pollutant depth of 73.6 m would occur at the end of the 20-year model run. These differences follow the expected results for these two compounds.

Given the conservative nature of these model scenarios, Phase I sampling efforts to depths scaled in time to the predicted curve should suffice as a minimum sampling scenario, accepting the model limitations, constraints, and assumptions.

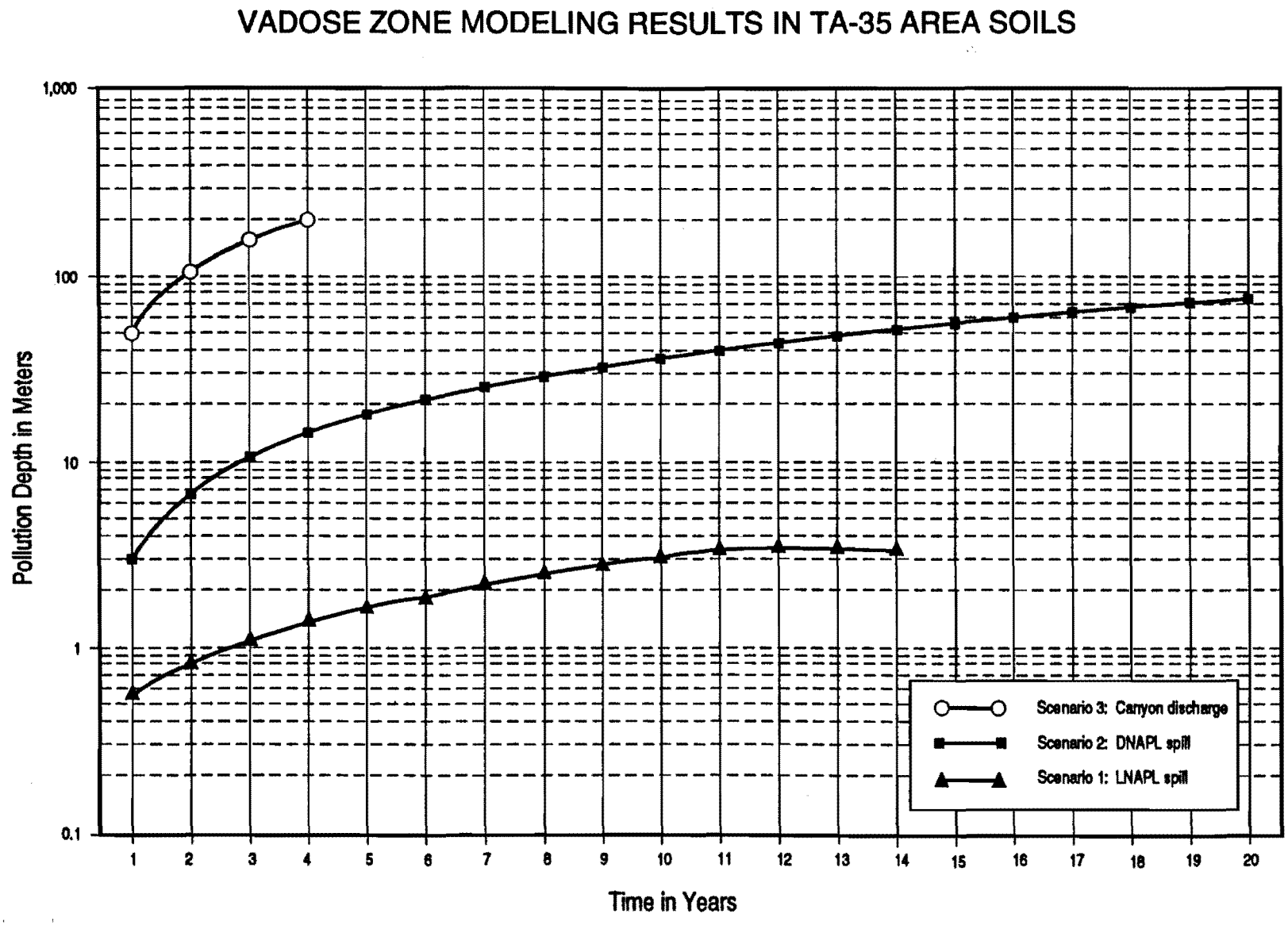


Figure 7-2. Vadose modeling results.

7.1.4 Results of Vadose Zone Scenario 3

This scenario simulated the effluent migration rate for pollutants contained in the continual discharge of the TA-35 wastewater treatment plant. The historical discharges from 1955 through 1963 were modeled for a 30-year term. Records of the discharges are not complete, but the amount of effluent discharged was estimated to average about 90,000 liters a month. Witnesses indicated that a 190,000-liter spill disappeared into the canyon soils within 175 yards of the outfall. For modeling purposes, the discharges were assumed to be loaded onto an area of 5 m by 150 m.

The SESOIL model predicted that the DNAPL pollutant would reach the 200-m bottom of the Totavi soil/Bandelier Tuff column in just four years. Results indicate that the Ten Site Canyon area should be explored to a greater depth than the mesa tops. Because of the proximity of the discharge site to known joint swarms and mapped faults in the tuff transecting the canyon, some investigation of the area's geologic structure and fracture filling material also seems warranted. Although broader in scope, these investigations are necessary to help define the potential migratory conditions for any contaminant plume.

7.1.5 Results of Airborne Radionuclide Emissions Model

Atmospheric dispersion modeling is designed to help define an area of probable maximum deposition of radionuclides from selected stacks. This enables the sampling plan to immediately focus on the areas with a greater probability of a find. Stack FE54 (further discussed in Section 7.15) on the northeast corner of the Radiochemistry Laboratory (TA-48-1) was chosen because this stack has a long history of monitoring results. The measured stack parameters (velocity, diameter, and height) were used as inputs, along with the actual measured source term emission rates from 1967 through 1990. The wind rose (a diagram that summarizes statistical information about wind speed and direction) from TA-59 was used. It was assumed that most emissions occurred during the daytime (regular business hours), so atmospheric stability classes E and F, which normally occur only at night, were ignored. The AIRDOS output was expressed in terms of air concentration by distance in the 16 wind directions analyzed. This output was then converted to a rate of deposition and summed for the total time span. This data was then gridded by a kriging program (SURFER), and isopleth maps were generated (Figures 7-31 and 7-32) (formerly Figures 7-36 and 7-37).

The results clearly showed that the pattern of deposition is centered about 50 m northwest of the source stack and that the total plume of deposition has an elongated north-northwest-trending axis. Based on these results, sampling should occur northwest of TA-48-1.

7.1.6 Aqueous Speciation and Mobility of Strontium

One of the primary concerns within the many SWMUs at OU 1129 is the possibility that radionuclides are present and, if they are present, their level of mobility or migration potential. Waste streams or plumes that contain both organic compounds and radionuclides could occur in OU 1129. Solute molecule-radionuclides are usually readily sorbed by soil particles within the first few centimeters of soil and do not present much of a migration threat in low concentrations. Organic dipoles and large organic ions are preferentially accumulated (sorbed) at the solid-solution interface, primarily because their hydrocarbon parts have a low affinity for the

aqueous phase. The soils in OU 1129 usually have a fairly good cation-exchange capacity, so the expected behavior of cationic nuclides will be sorption in the upper soil horizons.

The behavior of radionuclides in an environment in which complexation with anionic ligands of some organic compounds was questionable. However, the PCGEMS system was not suitable for actually modeling the transport of cations of metals. A basic prediction of aqueous speciation and mobility could be derived from the PHREEQE computer code.

Although this Work Plan does not explore this behavior in detail, the initial results of this groundwater chemistry model tended to support the potential for greater mobility of radionuclides in environments in which anionic ligands of heavy organics are present. These results are summarized, with extended captions, in Figures C-2 through C-6 in Appendix C. The sampling plan for Ten Site Canyon (Section 7.8) considers the data in results from the Scenario 3 vadose zone modeling as partial justification for extending sampling to greater depths where a potentially mixed waste stream occurred.

7.2 Radionuclide Deposition Modeling at OU 1129

Two stack effluent release points have been identified at OU 1129 as the most significant airborne contributors to local radionuclide soil deposition. Stack FE54 at TA-48 has released plutonium, uranium, and mixed fission products. The second stack, which was identified as a stack vented on the south side of the original Ten Site laboratory and office building (TA-35-2) at TA-35, has released plutonium and tritium. Both facilities have operated from the 1950s until the present. Stack releases from TA-35 are generally smaller than those from TA-48, but they are considered great enough to pose potential present day health concerns.

TA–48 Releases

Releases from TA-48 date as far back as 1957, although release data were found only from 1967 to the present. Available release data indicate that the earlier releases were considerably larger than more recent ones, presumably because of both superior engineered mitigating features and increased regulatory concern. A total of about 512 µCi of plutonium have been discharged out of the stack. Of that amount, 439 µCi (86%) was released between 1967 and 1970. Significant undocumented quantities could have been released before 1967.

Plutonium releases from TA-48 are assumed to be a composite mixture of plutonium isotopes including ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{241}Pu, and ^{242}Pu. The plutonium mixture was separated into individual isotopic contributions using a breakdown for Rocky Flats Plant weapons-grade plutonium. Of these isotopes, ^{238}Pu and ^{239}Pu are known to contribute most to radiological health concerns and were individually modeled for local deposition. Older plutonium releases have experienced enough radiological decay for significant amounts of ^{239}Pu to become depleted. In addition, the ^{241}Pu component has had enough time to form significant quantities of daughter ^{241}Am. To account for these changes with time, the annual releases were adjusted for both radiological decay and formation of the americium daughter. A current-day cumulative total of 5.2 µCi ^{239}Pu, 30.0 µCi ^{239}Pu, and 9.2 µCi ^{241}Am was calculated to have been released from Stack FE54.

Uranium releases are documented as far back as 1974. A total of 207 µCi of enriched uranium (^{235}U and ^{238}U) was documented as released from Stack FE54. As with plutonium, significant uranium releases likely occurred before 1974. Uranium half-lives are sufficiently long to preclude changes in composition from radiological decay during the release periods.

Mixed fission products were also released from Stack FE54. A total of 19,800 µCi of released fission products were documented from 1974 to the present. Additional releases are suspected before 1974. The most significant fission products in the mix include ^{90}Sr, ^{137}Cs, and ^{144}Ce. As with plutonium, radionuclide releases occurred sufficiently long ago, and half-lives are short enough to require a correction for radiological decay. A current-day cumulative total of significant radionuclides in the mix include 1000 µCi ^{90}Sr, 570 µCi ^{137}Cs, and 48 µCi ^{144}Ce, which were calculated to have been released from TA-48.

TA-35 Releases

Releases from TA-35 date as far back as 1951, although release data were found only from 1974 to the present. Available release data indicate that the earlier releases were considerably larger than more recent ones. A total of about 31 µCi of plutonium have been discharged out the stack. Of that amount, 27 µCi (87%) was released between 1974 and 1979. Significant undocumented quantities could have been released before 1974. As with TA-48 plutonium releases, the older releases at TA-35 must be corrected for radiological decay and americium ingrowth. A current-day cumulative total of 0.34 µCi ^{238}Pu, 1.8 µCi ^{239}Pu, and 0.34 µCi ^{241}Am was calculated to have been released out of the TA-35 stack.

Tritium releases at TA-35 have been documented only since 1974. Tritium, with a 12.3-year half-life, must be corrected for radiological decay. Of the 16,400 Ci of tritium released since 1974, a current-day cumulative total of only 7050 Ci was calculated to remain.

7.2.1 Modeling Local Deposition from Stack Releases

Particulate and tritium depositions from TA-48 and TA-35 stack releases were calculated using the AIRDOS-EPA computer code. Although it was originally developed for calculating radiological doses, AIRDOS-EPA also performs state-of-the-art air dispersion analysis. AIRDOS-EPA is a continuous point source Gaussian dispersion model approved by the EPA. AIRDOS-EPA is one of only a few codes EPA accepts for demonstrating compliance with the Clean Air Act under 40 CFR 61, Subpart H.

Plume depletion and deposition processes contained in AIRDOS-EPA include dry deposition, gravitational settling, and precipitation scavenging. Of these processes, only dry deposition is believed to be a significant deposition process. Particulates contained in stack effluents are too small to be appreciably affected by gravity, and annual precipitation is too low for significant precipitation scavenging.

Dry deposition considers the effects of plume contact with the ground and is calculated using a dry deposition velocity that is a function of both the local vegetation and the chemistry and size of the particulates. For these calculations a dry deposition

velocity of 0.0018 m/s is assumed for particulates, and a value of 0.035 m/s is assumed for tritium. These are generic values recommended by the authors of the AIRDOS-EPA code. The tritium value is greater because of its generally greater chemical reactivity.

Stack release parameters are incorporated into the calculation of the plume release height. Release height is the sum of the physical stack height and plume rise. Plume rise is calculated from the plume's momentum using the Rupp formulation, which uses plume diameter and exhaust velocity.

The radionuclide releases are modeled as being released uniformly over a single year. Accordingly, meteorological data representative of an entire year is used. The AIRDOS-EPA code requires that average wind speeds be supplied for each of six atmospheric stability classes in each of sixteen wind direction categories. Appropriate meteorological data used in the analysis were supplied by Group ESH-8 (formerly EM-8) at the Laboratory.

7.2.2 Levels of Local Radionuclide Deposition

Results from the AIRDOS-EPA analysis show a maximum deposition activity located about 100 m northwest of both the TA-48 and TA-35 stacks. Maximum alpha activity at TA-48 was calculated for ^{239}Pu with a surface deposition of about 6×10^{-5} pCi/cm^2 (0.6 pCi/m^2). Total alpha contributions from ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{241}Am, ^{235}U, and ^{238}U place the cumulative maximum surface alpha activity at about 1.6×10^{-4} pCi/cm^2 (1.6 pCi/m^2). Most significant beta/gamma surface concentrations at TA-48 occurred for ^{90}Sr and ^{137}Cs at 870 pCi/cm^2 and 1700 pCi/cm^2, respectively.

At TA-35 the greatest alpha surface concentrations were calculated 100 m northwest of the stack location with a value of 5.0×10^{-6} pCi/cm^2 (5.0×10^{-2} pCi/m^2) for ^{239}Pu and a cumulative alpha surface concentration of about 1.0×10^{-5} pCi/cm^2 (1.0×10^{-1} pCi/m^2) from all plutonium isotopes and from americium. A maximum surface tritium concentration was estimated to occur between 50 m and 100 m northwest of the stack with a peak value of 0.0045 Ci/m^2.

Isopleth maps of the modeled deposition for each of these stacks can be found with the sampling plan for the associated SWMUs in Aggregate K (Figures 7-31 and 7-32) (formerly Figures 7-36 and 7-37).

7.3 Use of Three-Dimensional Random Sampling and Judgmental Sampling in OU 1129 SAP Development

The goal of Phase I sampling within OU 1129 is to determine the presence or absence of COCs. Those SWMUs containing COCs will undergo Phase II investigation; those SWMUs not showing any COCs will be recommended for NFA. The problem was to identify a method that would produce sampling locations and numbers to help determine the presence or absence of COCs.

The commonly used EPA approach to determine how many samples to collect (the variable N) is based on calculating N for a chosen confidence interval (CI), where N is a function of sample variance and CI is compared to a regulatory threshold value for the sampled pollutant concentration (EPA 1986, 8793). Unfortunately, no regulatory thresholds, action levels, or any other comparison values for radionuclides currently exist. Therefore, this approach to defining adequate sample numbers does

not suffice for sites at OU 1129. To select the number of samples and sampling locations at the SWMU sites, a combination of judgmental sampling, search sampling, and random sampling was chosen.

7.3.1 Judgmental and Search Sampling

As previously stated, the purpose of Phase I investigations is to determine whether COCs are present. Judgmental sampling in combination with search sampling was the method chosen for selecting the number and location of samples to be collected for most SWMUs in OU 1129.

Judgmental sampling is the subjective selection of sampling locations based on professional knowledge of contaminant behavior in the media being sampled. This professional knowledge includes an understanding of the physical and chemical mechanisms that determine the fate of contaminants released to the environment. For example, contaminants with cationic tendencies would likely be sorbed by available clay molecules in surface soils. Therefore, sampling for this type of contaminant would be limited to shallow depths.

Search sampling is the selection of strategic sampling locations based on archival information (such as aerial photographs and previously collected data) and the results of surveys (such as radiological and multispectral) that indicate where contamination is located. An example of a strategic location is a drainage network, which would be sampled to determine pollution sources, "hot spots," or elevated contamination levels.

7.3.2 Random Sampling Method

Initial site investigations will focus on sampling areas where known or suspected COCs occur, so that the first efforts will be directed toward those locations likely to yield a "hit" if contamination exists. Because the precise nature of contamination is largely unknown at many OU 1129 SWMUs, a three-dimensional random sampling approach was used to aid in designing the Phase I sampling plans in those SWMUs where judgmental and search sampling were not feasible. This method is consistent with methods proposed in SW-846 (EPA 1986, 8793) for investigating large tanks, landfills, and lagoons where clear delineation of horizontal and vertical contaminant distribution is not known.

The analogy established within OU 1129 is to treat each SWMU or proximal group of SWMUs (where search or judgmental sampling is not appropriate or possible) as a large three-dimensional block (Figure 7-3). The surface extent of a SWMU, which is determined from archival sampling data or estimated from archival descriptions or site visits, sets the maximum x and y limits of the block. The depth of a SWMU, which is determined from the modeling of worst-case transport scenarios for various pollutants, sets the maximum z limit of the block. (For purposes of sampling plan development and modeling, movement of COCs in the vadose zone is assumed to be largely vertical and minimally horizontal; see the modeling description in Section 7.1.) This block can then be divided further into a series of cells or nodes by placing an arbitrary x-y grid on the surface and assigning z intervals on the basis of sampling tool dimensions.

Theoretically, if the x-y-z coordinates for sampling are randomly selected, any individual cell has an equal chance of being sampled. In the case of the vertical

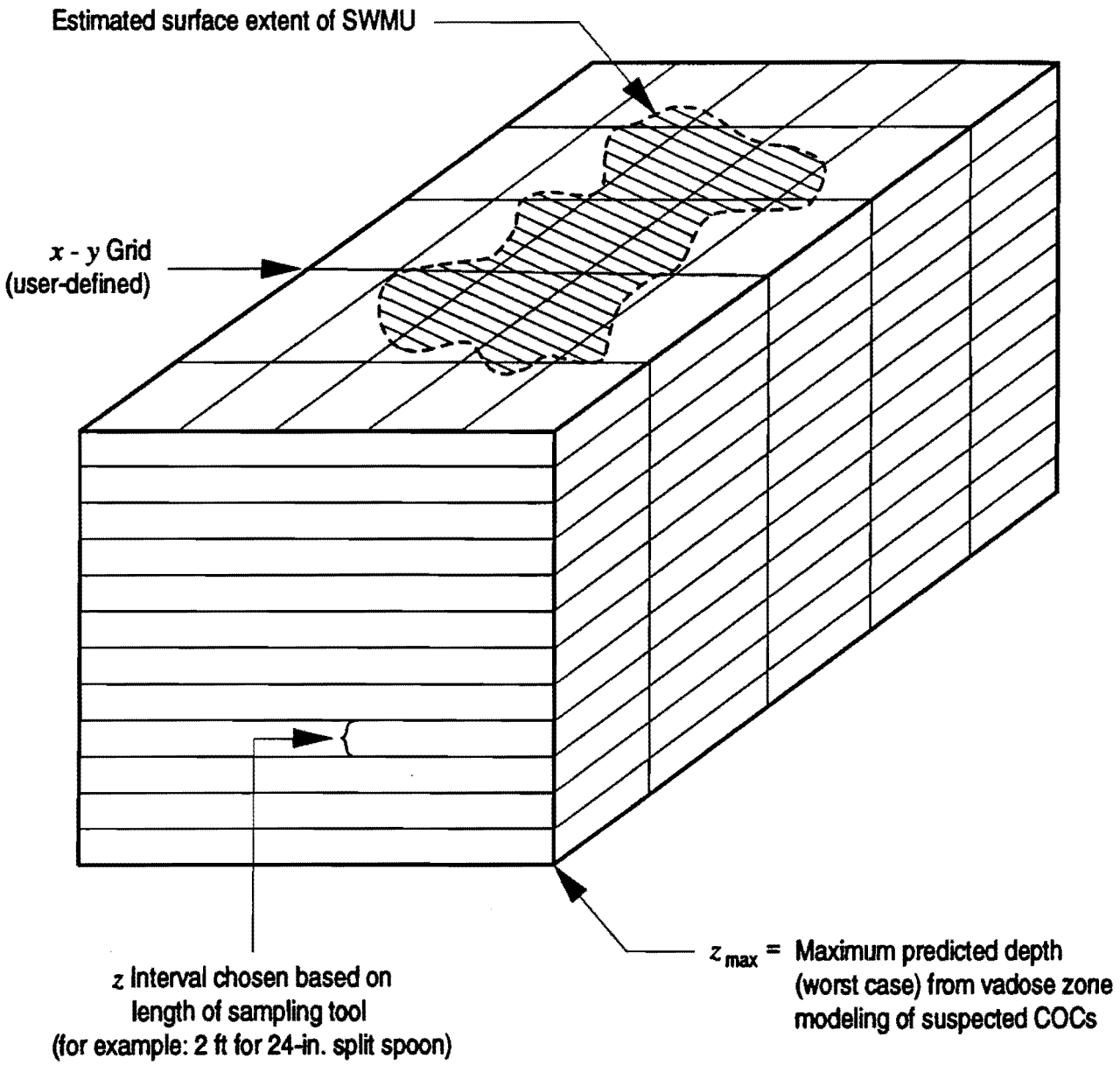


Figure 7-3. Three-dimensional modeling.

spacing, the chance of missing a pollutant horizon by using fixed interval sampling is reduced. The results from this sampling method may be evaluated later for effectiveness. However, the results will be used to improve the Phase II sampling plan or justify NFA recommendations. The advantage of this approach is cost effectiveness; a minimum number of sampling locations and analyses can produce a statistically valid view of the presence or absence of contamination within the block being investigated.

7.3.3 Use of Random or Judgmental Sampling in SAP Development

The use of random or judgmental sampling in designing a sampling plan for Phase I investigation of any SWMU or SWMU aggregate is straightforward and is combined with modeling results (where available), knowledge of contaminant behavior, and physical features of the sites to produce a realistic sampling plan. The basic process consists of the following steps.

1) The lateral extent of the SWMU or SWMU aggregate is defined according to archival data, contaminant behavior, amount and type of contaminant released, type of release, and soil/surface properties. A set of x and y coordinates (somewhat larger than the spill or release area) or strategic sampling locations are chosen.

2) The maximum likely vertical extent, which depends on the type of pollutant, is estimated from modeling or may be based on topographic, stratigraphic, or other physical factors such as soil/tuff interface.

3) A user-defined spacing grid is layed over the site and sampling grid locations, and sampling depths (z) are randomly generated for as many boreholes and sample intervals within the block as the user directs. (In this case, a small compiled BASIC computer code was written that restricts random number generation to the range of grid nodes or cells within the specified block.) (Note: An approach like this was used for Aggregate D. However, for most SWMUs sampling depths are chosen based on the tool used for sampling. For example, auger holes are sampled at 1-ft intervals, and every interval is sampled, not just random intervals.)

4) The sampling plan is then written with the randomly or judgmentally selected sampling locations. The analytical suite for each sample location is determined by the user based on process knowledge and archival data. If no historical information exists, complete analytical suites are specified. The minimum sampling depth for any borehole is the maximum z value randomly chosen unless the plan calls for a default minimum for that hole, as explained in the following text.

The user may choose to also sample at some default depth or location (for example, the maximum depth a drill rig can reach, the depth of the soil/tuff interface, or the past location of a structure). This choice depends on a knowledge of the SWMU, a knowledge of the COCs and their behavior, or the discovery of "hot spots" during screening of a continuous core. An example of this method is chosing to collect at least one sample near the surface of a site with radionuclides because the concentration of radionuclides through cationic adsorption to soil clay particles is expected. The method is designed to allow flexibility in the sampling approach.

7.3.4 Sample Numbers

The sample numbers that appear on all Phase I sampling summary tables are composed of the aggregate letter, the Facility for Information Management, Analysis, and Display (FIMAD) number, and the sample type designator. The FIMAD number (or site identification number) is composed of the TA number, a hyphen, and a four digit number. A FIMAD number is assigned to each location where a sample will be collected at a specific x and y coordinate. The FIMAD number is followed by another hyphen and a letter that designates the type of sample. The designators and the sample type they represent are as follows.

- B – borehole
- A – auger hole
- S – surface
- W – water
- G – sludge (grab)

The letter designator is followed by a number. If more than one sample is collected at the same x and y coordinate, then the numbers following the letter designator change consecutively. For example, three sample numbers from Aggregate Q at TA-4 are Q4-2001-A1, Q4-2001-A2, and Q4-2001-A3. The first letter and number represent the Aggregate (Q4-2001-A1) and the TA (Q4-2001-A1). The middle four numbers are a sequential series assigned to OU 1129 by FIMAD (Q4-2001-A1) that corresponds to a specific sample location. These three samples are taken from an auger hole (Q4-2001-A1). The last number represents the sampling sequence in the auger hole. The first interval beneath the surface is A1, the second interval is A2, and the third interval is A3.

Only the aggregate letter and FIMAD number are used to identify sample points on aggregate maps because the sample number represents unique x, y, and z coordinates, and maps show only the x and y coordinates.

7.4 Surveys

SWMUs will be field surveyed before sample collection. These surveys include a site engineering (geodetic) survey, which will locate the SWMU and associated features, and an environmental survey, which will initially screen for environmental concerns.

7.4.1 Engineering Survey

Each SWMU will be surveyed according to procedures documented by the Facilities, Security and Safeguards Division (formerly the Facilities Engineering Division at the Laboratory). The survey will locate, stake, and document the extent of the SWMU, sampling locations, and surface features. Additional features, grids, or locations will be staked according to aggregate sampling plans discussed later in this chapter. The grids will be used to locate radiation surveys (walkovers) and, in some cases, to select sample locations. Results of the engineering survey will be recorded on the site base map, and all located points and survey lines will be recorded in the New Mexico state plane coordinate system. This survey data will be incorporated into FIMAD.

7.4.2 Environmental Survey

An environmental survey will be conducted at each SWMU. The survey will be used to identify both health and safety concerns and to coordinate the final sampling plan. These are predominately walking surveys using direct reading or recording instruments. The grid pattern established by the engineering surveys will be followed during the walking surveys, so that observations can be tied back to base maps of the site. As described in some sampling plans later in this section, environmental surveys will be conducted in erosional cuts or outfalls to complement the data collected using the grid patterns. A preliminary radiological survey will be conducted at each site. Additional radiological surveys, surveys for electromagnetism, and surveys for volatile organic compounds (VOCs) will be conducted as described in the individual sampling plans. Any positive results or observations will be recorded on the base map of the SWMU. In addition to characterization of the SWMUs, these surveys will be used to ensure the health and safety of personnel working at the sites.

For some sampling plans, the environmental survey will be used to select locations for biased sampling, the purpose of which is to identify contaminants at the site. The results of the environmental survey will be used as a preliminary assessment for areas where contaminants are not expected. Negative environmental results are not conclusive evidence of the absence of contaminants; however, positive results obtained at the beginning of SWMU characterization will allow for convenient redirecting of the investigation plans.

7.21 SWMU Aggregate Q, Phase I

Aggregate Q consists of the three SWMUs associated with former TA-4: SWMU Nos. 4-003(a and b) and SWMU No. 4-004. These SWMUs are located on a small finger-like mesa, Mesita del Buey, that extends eastward from the main Pajarito Mesa. The mesa is bounded on the north by Ten Site Canyon, which is a tributary of Mortandad Canyon, and on the south by Cañada del Buey. SWMU No. 4-004 and SWMU No. 4-003(a) are located south of Puye Drive near the western fence of TA-52; SWMU No. 4-003(b) is located north of Puye Drive adjacent to the former firing pit. The locations of these SWMUs are depicted in Figure 3-1.

SWMU No. 4-004 is the site of the darkroom and former photography laboratory building (TA-4-7) used to develop film of firing tests performed at former TA-4 (Ahlquist et al. 1985, 754). The location of TA-4-7, east of the western fence of TA-52 (Roy F. Weston, Inc. 1989, 11899), is depicted in Figure 7-44. The facility was built in 1948 and was demolished in 1956 (H-Division 1955, 21529; LASL 1949–1993, 31437). Because the building was used as a darkroom, photographic processing chemicals may have been disposed of by pouring them through a drain or drains in the darkroom. The outfall of the drain, which is located south of TA-4-7, has been designated SWMU No. 4-003(a). A 1988 survey possibly located the outfall in the drainage area next to the west edge of the TA-52 fence (Shafer circa 1989, 898). Photographic processing chemicals also may have been disposed of by pouring them on the ground outside the building (DOE 1987, 8663). Other laboratory processes or chemicals used in the facility are unknown, but in 1953 a radiation survey of the building disclosed beta contamination at a level of 2 mR/h on part of the darkroom floor, and the floor was subsequently removed (LANL 1990, 7511). No radioactive contamination was detected when the building was demolished in 1956 (Scholl 1989, 11740), and no monitoring or sampling for chemical contamination has been conducted at the site.

SWMU No. 4-003(b) is the drain outfall from the former laboratory control building (TA-4-3). The building was constructed in July 1945 and was removed in December 1956 (LASL 1943–1993, 31437). A 6-in.-diameter vitrified-clay pipe placed in the tuff directed waste to the north into Mortandad Canyon (Scholl 1989, 11740). The locations of TA-4-3 and SWMU No. 4-003(b) are depicted in Figure 7-45. No radioactive contamination was detected in a 1953 survey (LANL 1990, 7511), and no radioactive contamination was detected using portable instruments when the building was demolished. In 1988 Roy F. Weston, Inc., employees detected gamma radiation at 24 μR/h, which is nearly twice background level (LANL 1988, 12455; LANL 1988, 12456; and Shafer circa 1989, 898). There is no documented evidence of hazardous material spills or contamination in the building. The contradictory data between the reported results of the 1953 examination and the 1988 Roy F. Weston, Inc., report warrants further investigation. The outfall will be examined to determine if the radioactive levels present warrant further investigation or action. Although TA-4-3 was not used over an extended period of time, hazardous materials may have been used in the building and may have concentrated in the outfall. Further historical background on the SWMUs in Aggregate Q is presented in Chapter 3.0.

7.21.1 Sampling Plan Rationale and Objectives

The objective of this Phase I sampling plan is to determine the presence or absence of soil contamination at the site of TA-4-7 and its associated outfall, and at the site of the outfall from TA-4-3. If contamination is detected, a Phase II investigation will be conducted to determine the nature and extent of contamination at the site. Sampling activities at these sites use a judgmental approach directed toward

determining if chemical contamination is present at these sites and if the potential exists for surface and subsurface migration of these contaminants.

Contamination in the outfalls from TA-4-3 and TA-4-7 may have concentrated in the drainage from these buildings and may have percolated into near-surface soils by runoff. The assessment of whether contamination is present in these outfalls depends on whether these sites and outfalls can still be located.

Decision logic for Phase I field investigation activities to be conducted at SWMU Aggregate Q is presented in Figure 7-46.

7.21.2 Phase I Field Investigation Activities

An engineering survey of the site of TA-4-7 (SWMU No. 4-004 and SWMU No. 4-003[a]) will be directed toward locating the former site of this facility. Field notes taken in 1988 by Roy F. Weston, Inc., employees cite a possible location of the outfall from TA-4-7 (Shafer circa 1989, 898). If the site can be located, a radiological survey of the area, described in Section 7.6.2, will be conducted to verify the results of previous radiological surveys and D&D efforts. A grid for the radiological survey will begin at the intersection of the TA-52 fence and Puye Drive at the edge of Cañada del Buey. The grid will be 450 ft by 450 ft with 50-ft centers (Figure 7-44). If radiological "hot spots" are detected, they will be sampled by drilling a hole into the soil and sampling the hole at every foot of depth beneath the surface until the underlying tuff is encountered (approximately 3 ft in depth). If radiological contaminants are found at the 3-ft interval, the hole will be deepened until contaminants are no longer found. If "hot spots" are not detected, sampling will default to the locations selected near the likely location of the former buildings and outfalls.

A judgmental approach will be used to investigate the most likely sites for contamination. Four hand-augered holes will be drilled into the soil at the site of SWMU No. 4-004—one hole on each side of the probable building location to determine if photographic processing chemicals may have been disposed of around the building. If radiological contaminants are found at the 3-ft interval, the hole will be deepened until contaminants are no longer found or tuff is intersected, whichever is first. Composite samples will be collected from each foot of auger hole beneath the surface and analyzed for metals and gross-alpha, -beta, and -gamma. These samples will also be analyzed using gamma spectroscopy and alpha spectrometry.

Six hand-augered holes will be drilled to investigate SWMU No. 4-003(a). Three holes will be drilled perpendicular to the TA-52 fence where the drain outfall from TA-4-7 may have been located. The holes will be selected in the most likely location of the outfall and to each side to increase the probability that the outfall will be sampled. If no site evidence can be used to guide the selection of auger holes, the center hole will be placed adjacent to the fence and extend through the soil profile to underlying tuff, which is at a depth of approximately 3 ft, and the other holes will be placed along a line perpendicular to the fence at a distance of 5 ft from the center hole. This spacing is used under the assumption that the actual position of the outfall is likely to be located within a 10-ft-wide zone. Three additional auger holes will be drilled off the edge of the mesa where the outfall from TA-4-7 and surface drainage from the area may have spilled into Cañada del Buey. Samples will be collected at 1-ft intervals beneath the surface and analyzed for metals and gross-alpha, -beta, and -gamma. These samples will also be analyzed using gamma spectroscopy and alpha spectrometry. The sampling points are depicted in Figure 7-44.

A similar approach will be used to investigate the outfall from TA-4-3 [SWMU No. 4-003(b)]. An engineering survey will be conducted to locate the building, and the grid will be extended from Aggregate A another 80 ft to the west. The grid extension will use the same 40-ft centers and encompass the former site of TA-4-3 and the possible outfall into Mortandad Canyon. A radiological survey of the extended area will be conducted. Field notes and photographs taken during the LASCP project in 1985 may be useful in locating the outfall from TA-4-3. Samples will be collected at 1-ft intervals beneath the surface from three 3-ft auger holes located in drainage paths where the outfall for TA-4-3 may have been located. The samples will be analyzed for metals and gross-alpha, -beta, and -gamma. The samples will also be analyzed using gamma spectroscopy and alpha spectrometry.

7.21.3 Sample Screening and Analysis

Each soil sample will be screened for contact radiation using a scintillation detector. All sample packages will be screened for surface contamination and radiation. All samples will be analyzed for metals and gross-alpha, -beta, and -gamma. All samples will also be analyzed using gamma spectroscopy and alpha spectrometry. The samples to be collected and the analyses required for the Phase I investigation of Aggregate Q are summarized in Table 7-23.

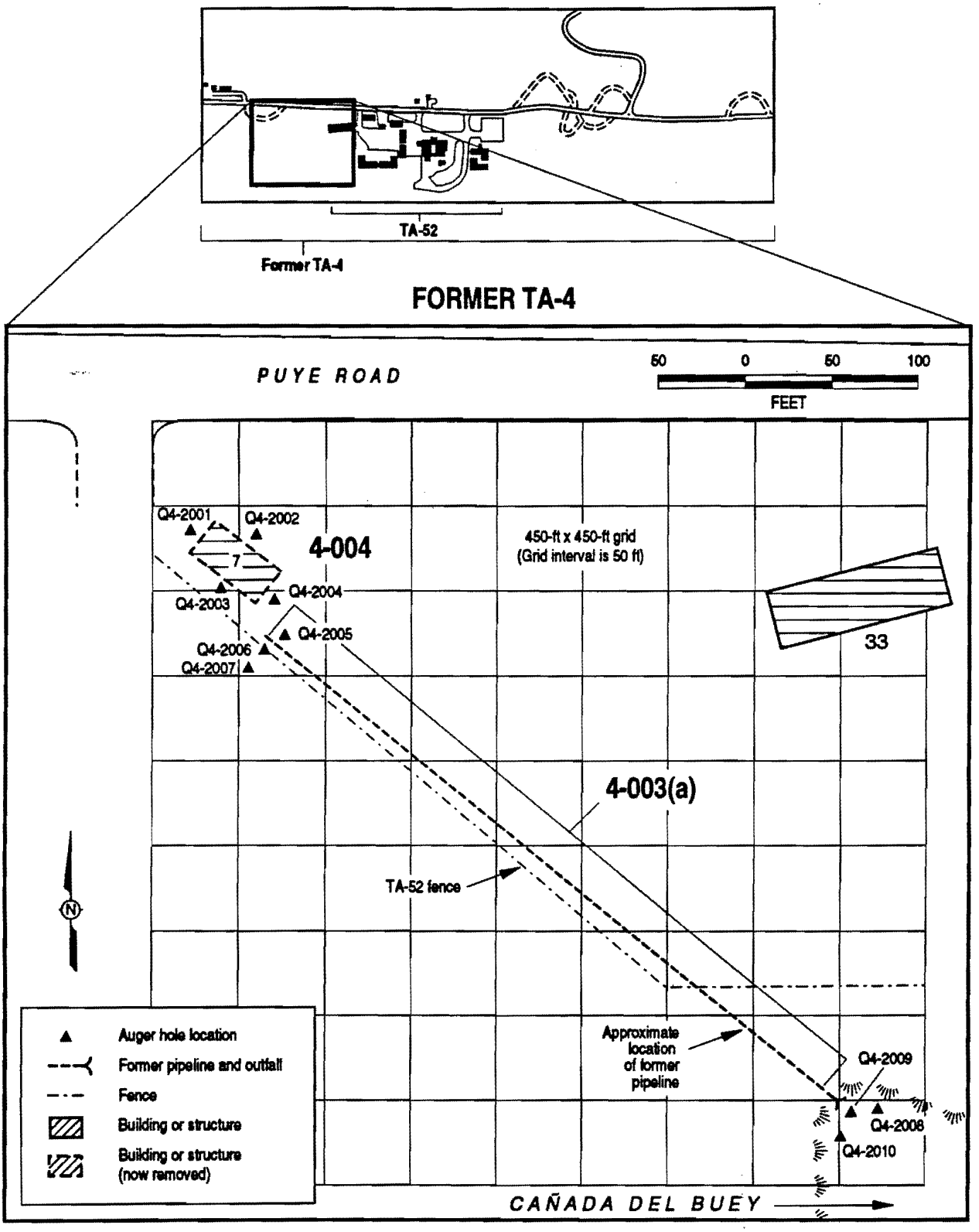


FIG 7-44[49]Q / EPA / 032394 ENG-R118 (LASL 1956, 23721)

Figure 7-44. Schematic sample location map for SWMU Nos. 4-003(a) and 4-004, Aggregate Q.

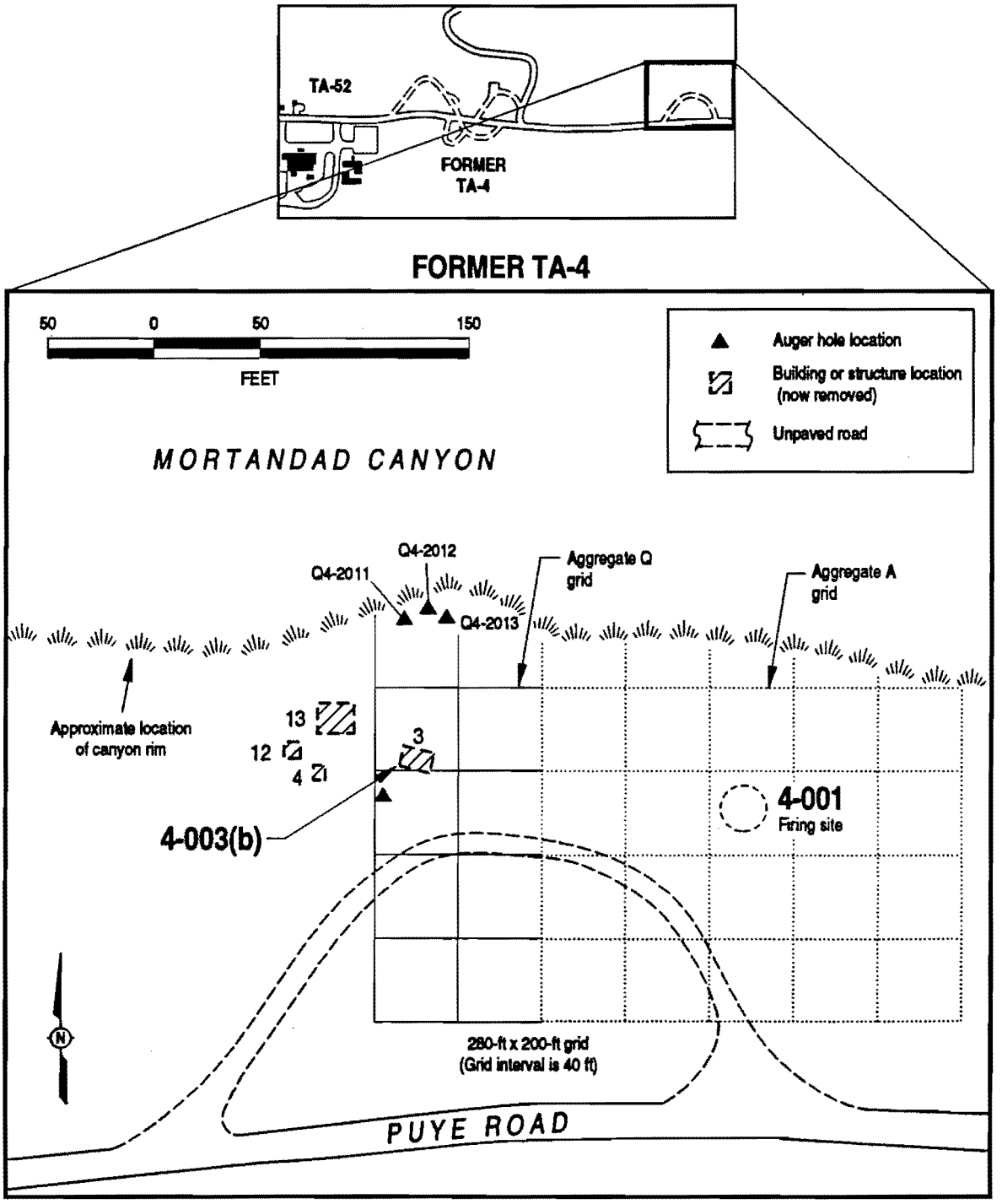


Figure 7-45. Schematic sample location map for SWMU Nos. 4-001 and 4-003(b), Aggregate Q.

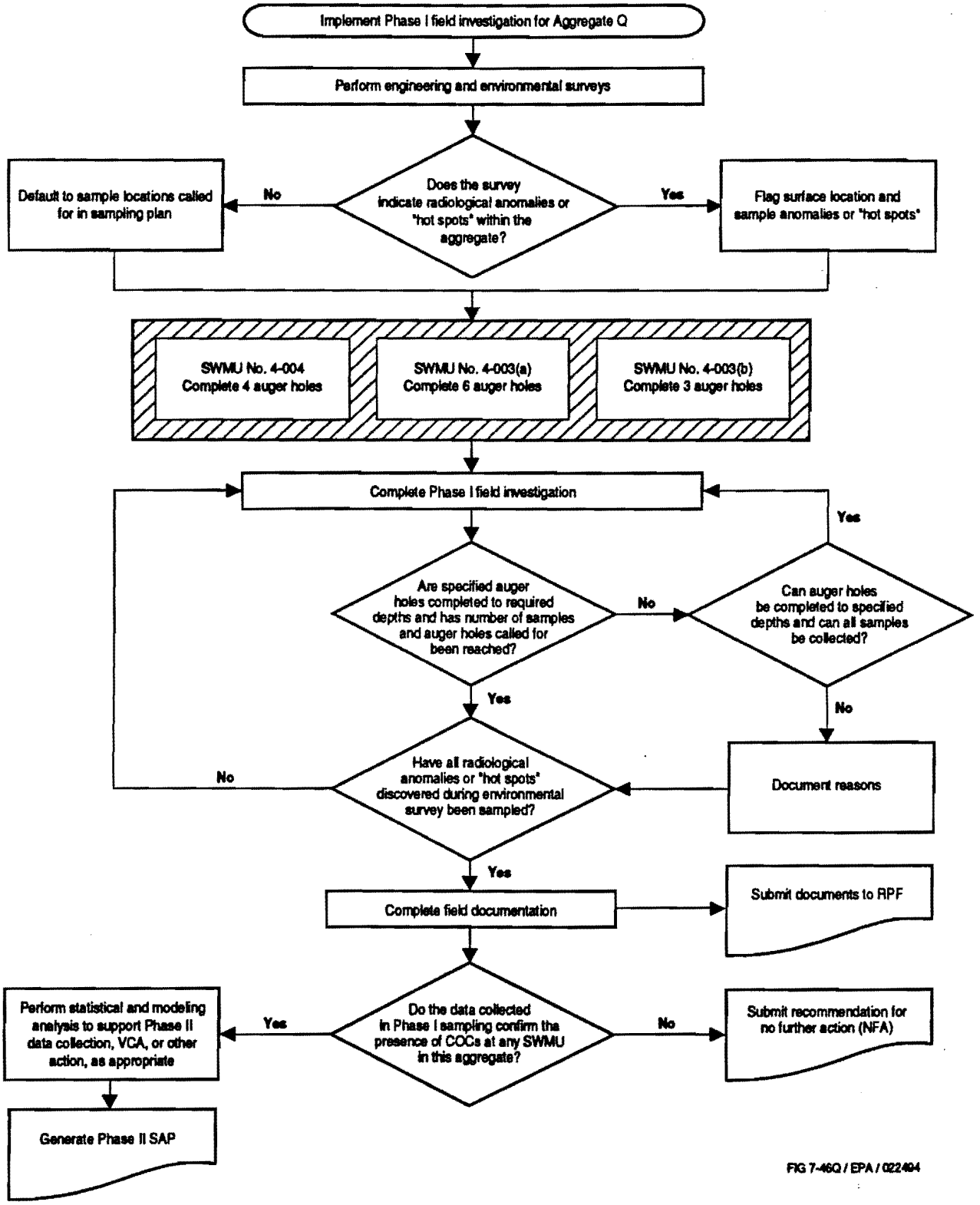


Figure 7-46. Decision logic for the sampling and analysis of SWMU Aggregate Q.

TABLE 7-23

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE Q

SWMU	SAMPLE NUMBER	DEPTH	Analyses Req'd*			
			Gross-alpha,-beta,-gamma	Gamma Spectroscopy	Alpha Spectrometry	Metals by XRF or ICPES
4-004	Q4-2001-A1	0–12 in.	1	1	1	1
	Q4-2001-A2	12–24 in.	1	1	1	1
	Q4-2001-A3	24–36 in.	1	1	1	1
	Q4-2002-A1	0–12 in.	1	1	1	1
	Q4-2002-A2	12–24 in.	1	1	1	1
	Q4-2002-A3	24–36 in.	1	1	1	1
	Q4-2003-A1	0–12 in.	1	1	1	1
	Q4-2003-A2	12–24 in.	1	1	1	1
	Q4-2003-A3	24–36 in.	1	1	1	1
	Q4-2004-A1	0–12 in.	1	1	1	1
	Q4-2004-A2	12–24 in.	1	1	1	1
	Q4-2004-A3	24–36 in.	1	1	1	1
4-003(a)	Q4-2005-A1	0–12 in.	1	1	1	1
	Q4-2005-A2	12–24 in.	1	1	1	1
	Q4-2005-A3	24–36 in.	1	1	1	1
	Q4-2006-A1	0–12 in.	1	1	1	1
	Q4-2006-A2	12–24 in.	1	1	1	1
	Q4-2006-A3	24–36 in.	1	1	1	1
	Q4-2007-A1	0–12 in.	1	1	1	1
	Q4-2007-A2	12–24 in.	1	1	1	1
	Q4-2007-A3	24–36 in.	1	1	1	1
	Q4-2008-A1	0–12 in.	1	1	1	1
	Q4-2008-A2	12–24 in.	1	1	1	1
	Q4-2008-A3	24–36 in.	1	1	1	1
	Q4-2009-A1	0–12 in.	1	1	1	1
	Q4-2009-A2	12–24 in.	1	1	1	1
	Q4-2009-A3	24–36 in.	1	1	1	1
	Q4-2010-A1	0–12 in.	1	1	1	1
	Q4-2010-A2	12–24 in.	1	1	1	1
	Q4-2010-A3	24–36 in.	1	1	1	1
4-003(b)	Q4-2011-A1	0–12 in.	1	1	1	1
	Q4-2011-A2	12–24 in.	1	1	1	1
	Q4-2011-A3	24–36 in.	1	1	1	1
	Q4-2012-A1	0–12 in.	1	1	1	1
	Q4-2012-A2	12–24 in.	1	1	1	1
	Q4-2012-A3	24–36 in.	1	1	1	1
	Q4-2013-A1	0–12 in.	1	1	1	1
	Q4-2013-A2	12–24 in.	1	1	1	1
	Q4-2013-A3	24–36 in.	1	1	1	1
Rinsate Blanks			2	2	2	2
Bottle Blanks			0	0	0	2
Trip Blanks			0	0	0	0
Duplicates			2	2	2	2
TOTALS			43	43	43	45

* Section 5.0 of "Generic Quality Assurance Project Plan for RCRA Facility Investigations for the Los Alamos National Laboratory Environmental Restoration Program" (LANL 1991, 31294) includes US EPA SW-846 quantitative and detection limits for the various required analytes.

7.22 SWMU Aggregate R, Phase I

Aggregate R consists of six SWMUs and one AOC at TA-5: SWMU No. 5-001(c); SWMU No. 5-005(b); SWMU Nos. 5-006(b, c, e, and h); and AOC No. C-5-001. These SWMUs and this AOC are located on Mesita del Buey, an extension of the Pajarito Mesa, which is east of TA-52 along Puye Drive. The mesa is bounded on the north by Ten Site Canyon, which is a tributary of Mortandad Canyon, and on the south by Cañada del Buey.

SWMU No. 5-001(c) is a firing pit that was used for at least two tests involving explosives. The site was used for half-scale tests for the Trinity device, using up to 2500 lb of high explosives (HE) (CEARP 1986, 8657). The exact location of this site is unknown. The site was used in 1945 and was reported to lie "some 700 ft east, just off the toe of the mesa" (LASL 1947, 7006). This firing point has been referenced on a map (LANL 1990, 7511) and may have been located several hundred feet to the east of the "original firing site" (DOE 1987, 8663). Employees who had worked at TA-5 during these tests were interviewed and could not recall the area or pinpoint it on maps. The structures reportedly visible from the site were the control building (TA-5-4), a trimming building (TA-5-6) farther back along the road, and a medium-sized magazine (TA-5-3) (CEARP 1986, 8657).

Several attempts have been made to locate the far firing point of the firing pit. The LASCP report states that during extensive D&D of the site, a pile of gravel at the east end of TA-5 was found to contain pieces of metal contaminated with radioactivity levels up to 15 mR/h. The gravel was removed in September 1985 and taken to TA-54. Samples of the gravel were found to contain less than 25 pCi/g. It is possible that this is the site of SWMU No. 5-001(c) (LANL 1990, 7511).

The primary explosive material used at this site included Composition "B," primacord, detonators (DOE 1987, 8663), and possibly Baratol (Griffin 1992, 31273). A typical device contained tuballoy (natural uranium), and charges were generally uncased. During device assembly, the individual explosive charges were held in place by a wooden fixture that resembled a geodesic frame. The fixture was expended with the device (Griffin 1992, 31273). No record exists of any incomplete detonations; however, the presence of contamination is a concern (CEARP 1985, 8657). The shrapnel range from the large tests was considered to be far enough that State Road 4 was closed when these tests were conducted.

SWMU Nos. 5-006 (b, c, e, and h) are the sites of former structures located at TA-5. These sites are summarized in Table 7-24, and their locations are depicted in Figure 3-2.

TABLE 7-24

AREAS OF POSSIBLE SOIL CONTAMINATION BENEATH FORMER BUILDINGS

SWMU	TA SITE	DESCRIPTION	BUILT	BURNED	REMOVED
5-006(b)	TA-5-4	Control Building	1945	1960	1985
5-006(c)	TA-5-5	Calibration Facility/Shop/Darkroom	1944	1960	1985
5-006(e)	TA-5-19	Platform	1953		1985
5-006(h)	TA-5-9	X-Unit Chamber	1947		1985

SWMU No. 5-006(c) is the site of TA-5-5, which was built in 1944. The building has served several purposes: a darkroom, a shop, and a calibration facility. No documentation exists pertaining to how used photographic processing chemicals were disposed of at this site. When asked during interviews, personnel who had worked at the site agreed that used photographic processing chemicals were probably dumped on the ground outside the building (DOE 1987, 8663). In 1959 the building was listed as being contaminated with HE (Penland 1959, 806). In 1960 the building was burned (DOE 1987, 8663). The facility was used to calibrate high-range meters (radiation detectors) in the 1950s and again in 1972. The site was monitored with a Harshaw Model 301 phoswich detector during the 1985 LASCP, and no contamination was detected. The site has not been sampled for chemical contamination; therefore, metals from photographic processing, specifically silver, may be present. The outfall from TA-5-5 is designated as SWMU No. 5-005(b) and was discovered during a 1987 environmental restoration (ER) site reconnaissance visit.

SWMU No. 5-006(b) is the site of TA-5-4 located west of SWMU No. 5-001(a) (LANL 1989, 21555). In the same vicinity is SWMU No. 5-006(e), the site of a wooden platform. The platform was built in 1953 and removed in 1985 (Blackwell 1976, 762; LASL 1943–1993, 31437).

SWMU No. 5-006(h) is the x-unit chamber (TA-5-9) located west of steel barricade Firing Pit No. 2. Depleted uranium and uranium oxide were found in this area, and considerable D&D was performed in 1985, as described in Section 3.2.2. Samples taken after the cleanup of Firing Pit No. 2 and TA-5-9 did not reveal radiation levels above background. Similar results were obtained from the analysis of 36 samples taken on a grid over the area (LANL 1990, 7511). Material that was found to exceed a radiation level of 25 pCi/g was removed during the D&D effort.

AOC No. C-5-001 consists of two separate potential soil contamination areas. One area is associated with a former storage building (TA-5-8) (Figure 7-47); the other is associated with a former maintenance building (TA-5-21) (Figure 7-8). TA-5-21 is recommended for NFA in Chapter 6.0. TA-5-8 was built in 1944 adjacent to steel barricade Firing Pit No. 1 that was removed in 1950 (LASL 1943–1993, 31437). Because of its location adjacent to the firing pit, the area was probably contaminated with HE and uranium. The site went through D&D activities during the LASCP cleanup in 1985.

7.22.1 Sampling Plan Rationale and Objectives

The objective of Phase I sampling in SWMU No. 5-001(c) is to ensure that the D&D work was complete. The far firing point at SWMU No. 5-001(c) may have been the site of the gravel pile cleaned up during 1985 D&D activities. The site of the far firing point may still be contaminated with depleted uranium, and radioactive shrapnel may be present. The objective of Phase I surveying of the area is to locate the far firing point.

The objective of Phase I sampling of SWMU Nos. 5-006(b and c) is to determine if metals from photographic processing or HE are present and to determine if the potential exists for surface migration of the contaminants. The conceptual model for the site consists of possible contamination of the surface and near-surface where chemicals were repeatedly dumped in the past. Because of the low solubility of the compounds used in photographic processing, the contaminants may not have migrated beyond the point where they were dumped.

The objective of Phase I sampling of SWMU Nos. 5-006(b, e, and h) is to ensure that the D&D work was complete. These SWMUs are located in an area that was found to be contaminated with depleted uranium. SWMU Nos. 5-006(b and e) received considerable attention during the LASCP D&D in 1985. The surface debris and soil containing depleted uranium were removed. These sites may be contaminated with point sources, which are not likely to be concentrated by natural processes in the environment but are of concern if individuals were to collect contaminated fragments. D&D efforts at the site have included walking the area and removing surface debris, but over time previously undetected fragments may appear at the surface as a result of surface erosion. The D&D efforts did not address possible chemical contamination of the site, but no evidence suggests that chemical contamination of the site should be present. The objective of Phase I surveying of this area is to broadly search the area and to locate surface contamination, specifically surface and near-surface artifacts (projectiles, shrapnel, and other potentially contaminated objects).

If contaminants are detected in these areas, the potential for surface migration will be considered, and a Phase II investigation will be conducted to determine the nature and extent of contamination at each site.

A separate sampling plan is not necessary for SWMU No. 5-006(h) and AOC No. C-5-001 because they will be characterized during Phase I investigation of Aggregate B.

Decision logic for Phase I field investigation activities to be conducted at SWMU Aggregate R is presented in Figure 7-48.

7.22.2 Phase I Field Investigation Activities

Engineering surveys of SWMU No. 5-005(b) and SWMU Nos. 5-006(b, c, and e) will be conducted to locate the former sites of structures, if possible, and to establish grids for radiological and sampling surveys. Two separate grids will be established in Aggregate R; one will locate SWMU No. 5-001(c), and the other will encompass SWMU Nos. 5-006(b, e, and h).

A grid will be established to locate the far firing point of SWMU No. 5-001(c) (Figure 7-49). This grid will be located 650 ft east of Firing Pit No. 1 and will extend 200 ft farther to include both edges of the mesa. The grid will traverse the edge of the mesa and will be continued on 50-ft centers. A radiological and electromagnetic survey of these areas will be used to try to locate the far firing point and to verify the results of previous D&D efforts in the area of the gravel pile that was removed in 1985. Because the far firing point is assumed to be located either along the road or along the edge of the mesa, 20 surface samples will be collected at grid intercepts along the east-west traverses immediately north and south of Puye Road and at grid intercepts along the edge of the mesa. The data collected by the surveys and sampling programs in this Phase I investigation should be useful in determining the likely location of the far firing point. These samples will be analyzed for HE and gross-alpha, -beta, and -gamma. They will also be analyzed using gamma spectroscopy and alpha spectrometry.

The site of SWMU No. 5-006(c) will be surveyed to locate TA-5-5 and the sampling points (Figure 7-50). A hand-augered hole will be drilled from the surface to underlying tuff on three sides of TA-5-5. One composite sample will be collected from each 1-ft interval beneath the surface and analyzed for metals; semivolatile organic

compounds (SVOCs); HE; and gross-alpha, -beta, and -gamma. The samples will also be analyzed using gamma spectroscopy and alpha spectrometry.

Three additional hand-augered holes will be drilled at possible locations of SWMU No. 5-005(b). The auger holes will be approximately 20 ft apart and will be drilled to bedrock, which is at a depth of approximately 3 ft. Composite samples will be collected from the auger holes at 1-ft intervals beneath the surface and analyzed for metals; SVOCs; and gross-alpha, -beta, and -gamma. These samples will also be analyzed using gamma spectroscopy and alpha spectrometry.

The grid established for Aggregate B, which includes the area of SWMU No. 5-006(h), will be extended 160 ft to the west to include SWMU Nos. 5-006(b and e) (Figure 7-47). The grid for Aggregate B will be continued on 40-ft centers. A radiological survey of these areas will be used to verify the results of previous D&D efforts. The contaminants in these SWMUs are anticipated to be point sources that cannot be characterized by a sampling program. Therefore, samples are not planned for these SWMUs unless radiological anomalies are detected during the surveys.

However, if "hot spots" are detected in the vicinity of SWMU Nos. 5-006(b and e) or in the far firing point grid, hand-held detectors will be used to precisely define the "hot spot" locations and the lateral distributions of contaminants. The "hot spot" will then be sampled. The spatial distribution of contaminants will be determined by collecting one soil sample at a depth 6 to 12 in. below the "hot spot" and another sample 3 ft away at the same depth as the "hot spot." If contaminants are readily identified and can be removed easily, a voluntary corrective action (VCA) will be conducted to remove the artifact or "hot spot." Soil samples will be analyzed for metals; HE; and gross-alpha, -beta, and -gamma. They will also be analyzed using gamma spectroscopy and alpha spectrometry.

Artifacts or debris encountered at the surface during radiological surveys will be treated as potential sources of contamination and, when feasible, will be removed as a VCA and screened. Soil samples in contact with contaminated debris or artifacts will be characterized.

7.22.3 Sample Screening and Analysis

Each soil sample will be screened for contact radiation using a scintillation detector. All sample packages will be screened for surface contamination and radiation. All soil samples will be analyzed for gross-alpha, -beta, and -gamma. The samples will also be analyzed using gamma spectroscopy and alpha spectrometry. Samples collected from SWMU No. 5-006(c) will also be analyzed for metals, SVOCs, and HE. Samples collected from SWMU No. 5-001(c) will also be analyzed for HE. The samples to be collected and the analyses required for the Phase I investigation of Aggregate R are summarized in Table 7-25.

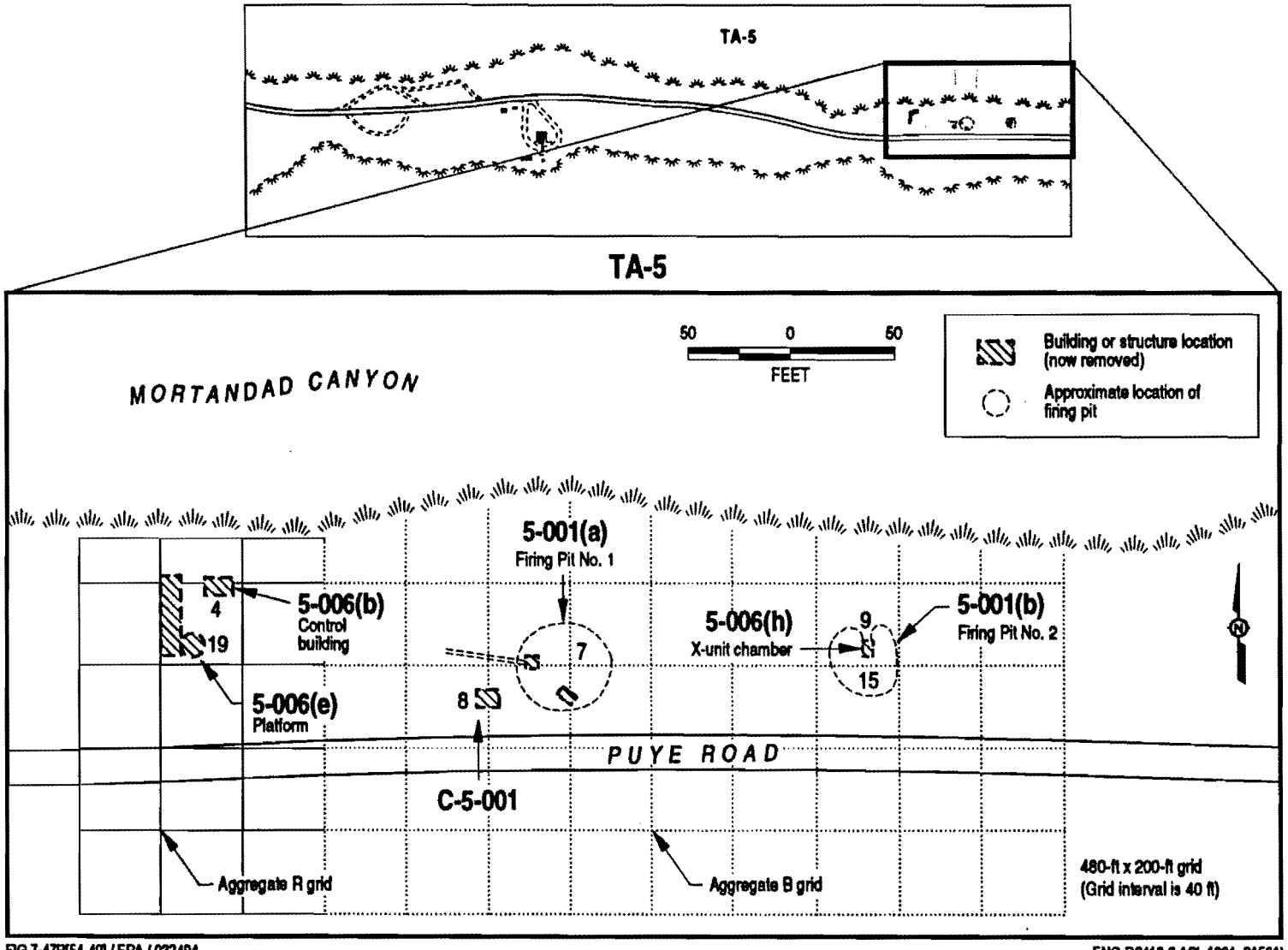


Figure 7-47. Schematic sample location map for SWMU Nos. 5-001(a and b), Aggregate B; and AOC No. C-5-001 and SWMU Nos. 5-006(b, e, and h); Aggregate R.

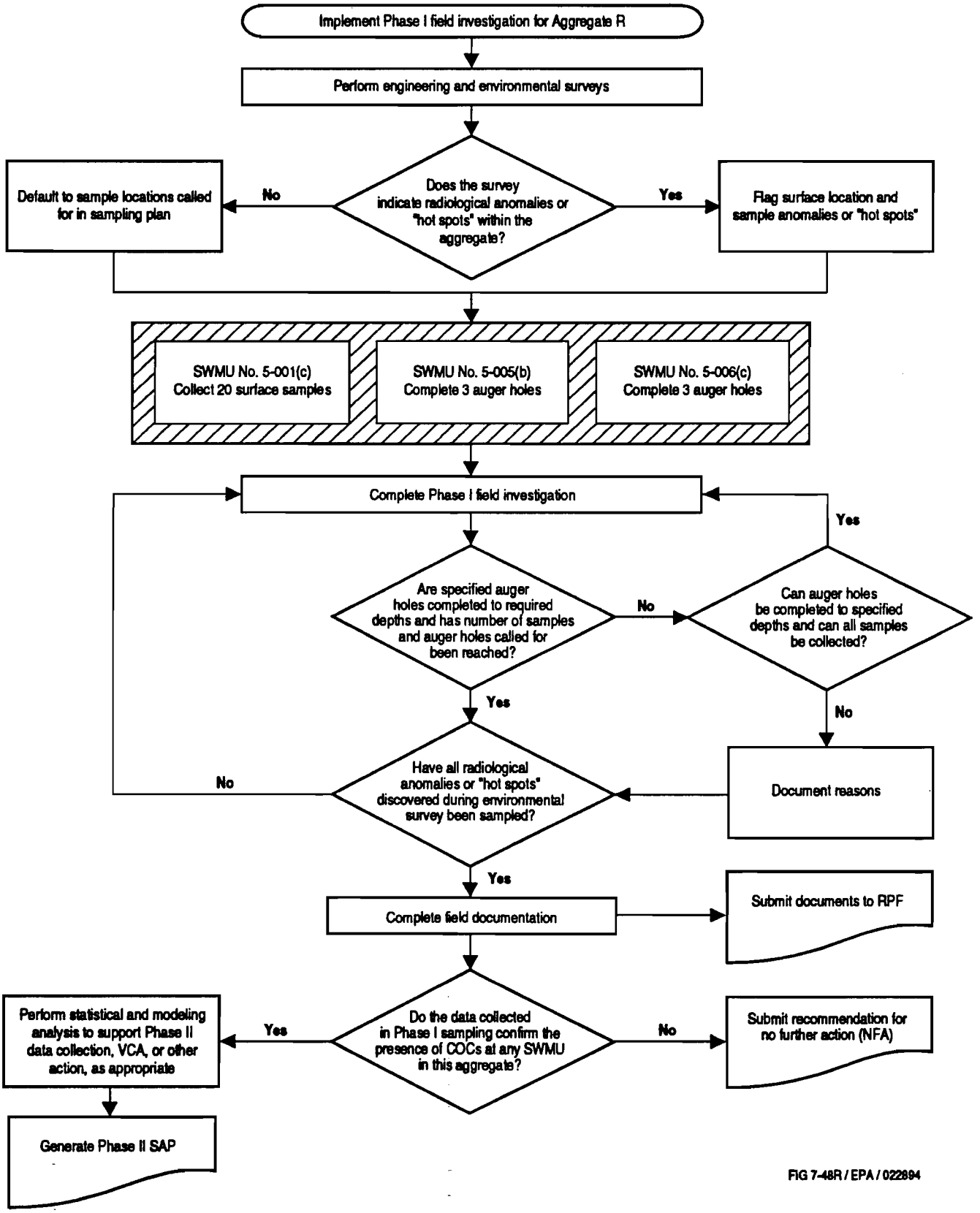


Figure 7-48. Decision logic for the sampling and analysis of SWMU Aggregate R.

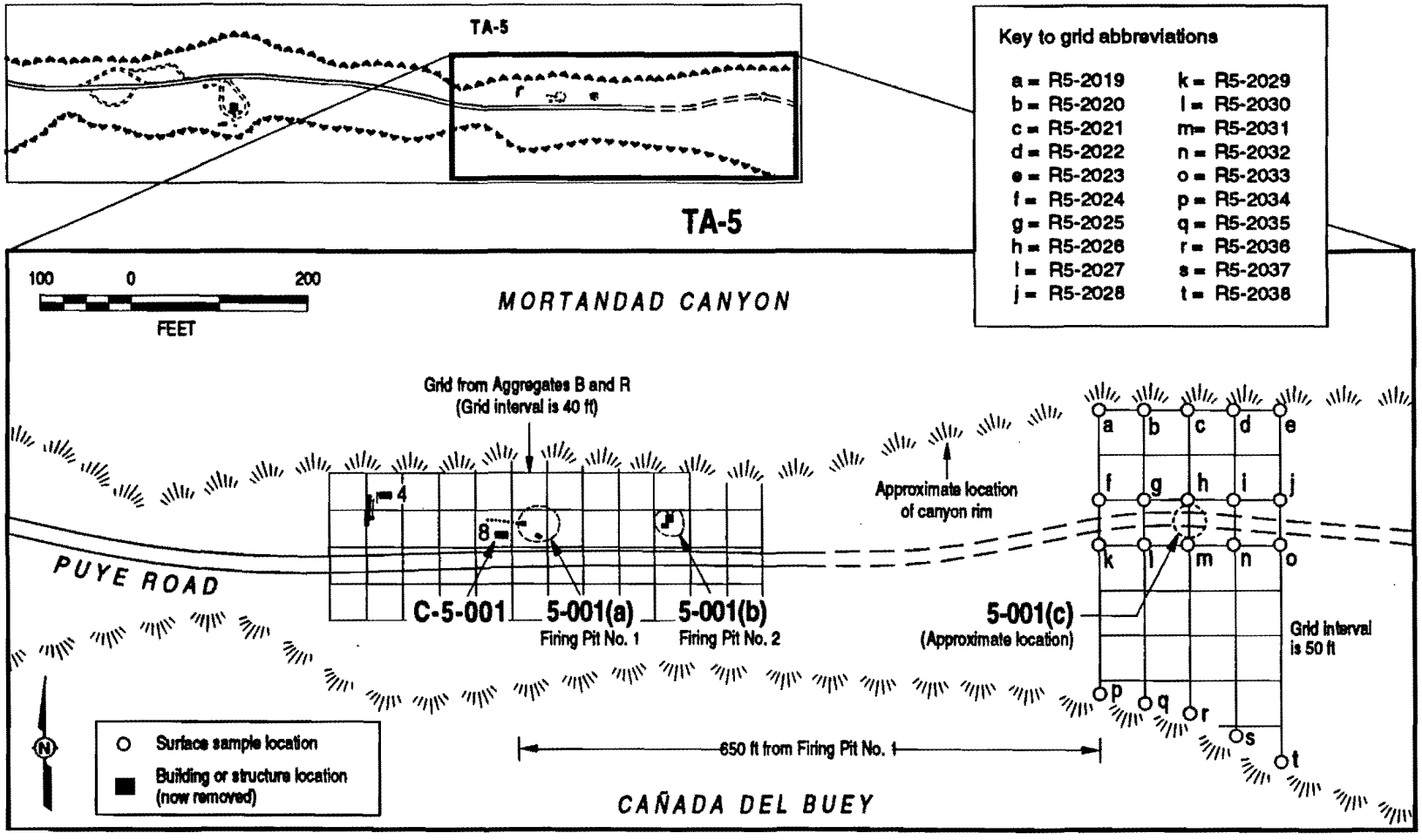


FIG 7-49R[55-50] / EPA / 032494

ENG-R2418 (LASL 1961, 21561)

Figure 7-49. Schematic sample location for SWMU Nos. 5-001(a and b), Aggregate B; and AOC No. C-5-001 and SWMU No. 5-001(c); Aggregate R.

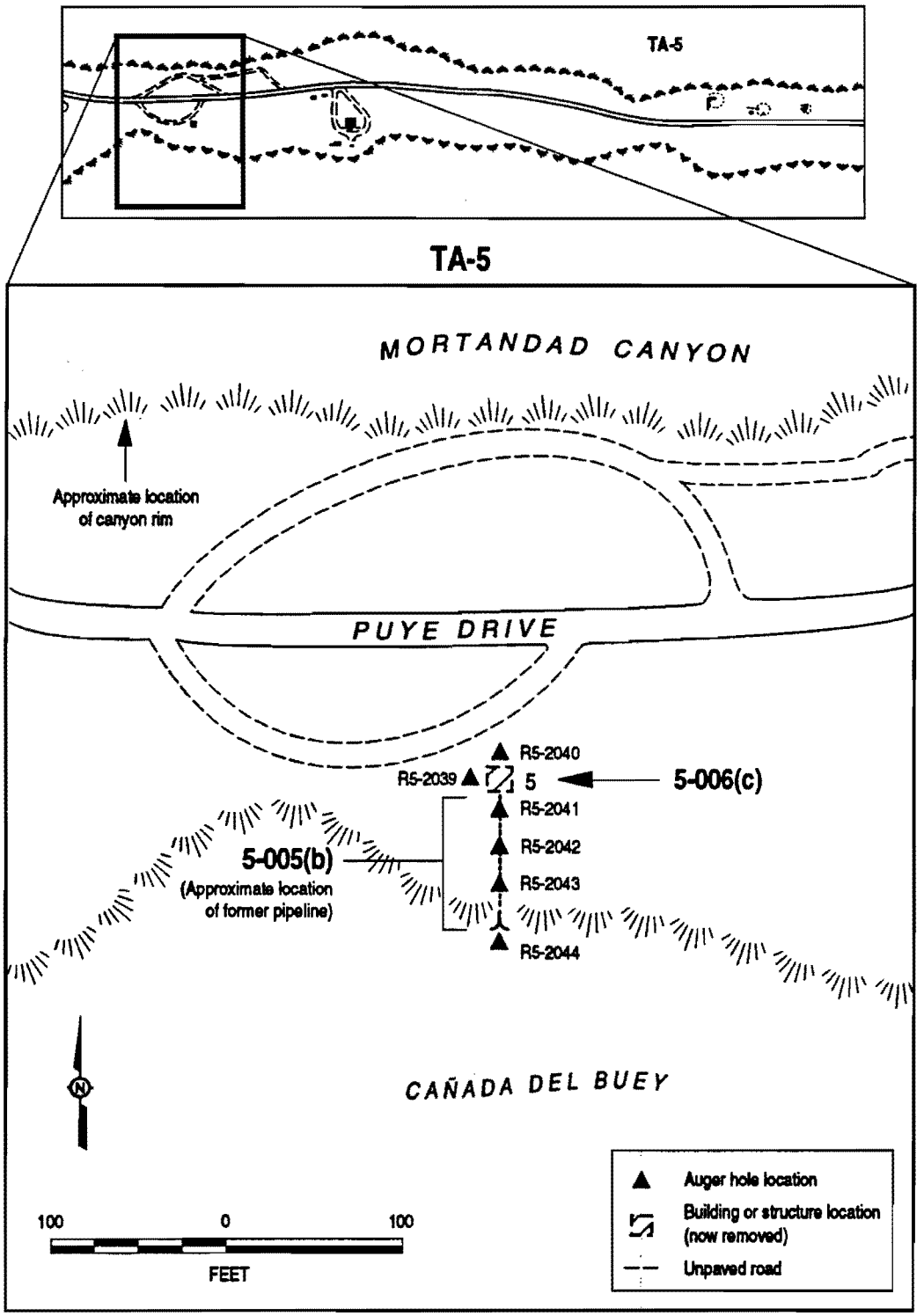


FIG 7-50[53-48] / 032494 ENG-R2418 (LASL 1961, 21561)

Figure 7-50. Schematic sample location map for SWMU Nos. 5-005(b) and 5-006(c), Aggregate R.

TABLE 7-25

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE R

SWMU	SAMPLE NUMBER	DEPTH	Analyses Required *					
			Gross-alpha,-beta,-gamma	Gamma Spectroscopy	Alpha Spectrometry	Metals by XRF or ICPES	SVOCs	High Explosives
5-001(c)	R5-2019-S1	Surface	1	1	1	0	0	1
	R5-2020-S1	Surface	1	1	1	0	0	1
	R5-2021-S1	Surface	1	1	1	0	0	1
	R5-2022-S1	Surface	1	1	1	0	0	1
	R5-2023-S1	Surface	1	1	1	0	0	1
	R5-2024-S1	Surface	1	1	1	0	0	1
	R5-2025-S1	Surface	1	1	1	0	0	1
	R5-2026-S1	Surface	1	1	1	0	0	1
	R5-2027-S1	Surface	1	1	1	0	0	1
	R5-2028-S1	Surface	1	1	1	0	0	1
	R5-2029-S1	Surface	1	1	1	0	0	1
	R5-2030-S1	Surface	1	1	1	0	0	1
	R5-2031-S1	Surface	1	1	1	0	0	1
	R5-2032-S1	Surface	1	1	1	0	0	1
	R5-2033-S1	Surface	1	1	1	0	0	1
	R5-2034-S1	Surface	1	1	1	0	0	1
	R5-2035-S1	Surface	1	1	1	0	0	1
	R5-2036-S1	Surface	1	1	1	0	0	1
	R5-2037-S1	Surface	1	1	1	0	0	1
	R5-2038-S1	Surface	1	1	1	0	0	1
5-006(c)	R5-2039-A1	0–12 in.	1	1	1	1	1	1
	R5-2039-A2	12–24 in.	1	1	1	1	1	1
	R5-2039-A3	24–36 in.	1	1	1	1	1	1
	R5-2040-A1	0–12 in.	1	1	1	1	1	1
	R5-2040-A2	12–24 in.	1	1	1	1	1	1
	R5-2040-A3	24–36 in.	1	1	1	1	1	1
	R5-2041-A1	0–12 in.	1	1	1	1	1	1
	R5-2041-A2	12–24 in.	1	1	1	1	1	1
	R5-2041-A3	24–36 in.	1	1	1	1	1	1
5-005(b)	R5-2042-A1	0–12 in.	1	1	1	1	1	0
	R5-2042-A2	12–24 in.	1	1	1	1	1	0
	R5-2042-A3	24–36 in.	1	1	1	1	1	0
	R5-2043-A1	0–12 in.	1	1	1	1	1	0
	R5-2043-A2	12–24 in.	1	1	1	1	1	0
	R5-2043-A3	24–36 in.	1	1	1	1	1	0
	R5-2044-A1	0–12 in.	1	1	1	1	1	0
	R5-2044-A2	12–24 in.	1	1	1	1	1	0
	R5-2044-A3	24–36 in.	1	1	1	1	1	0
Rinsate Blanks			2	2	2	1	1	2
Bottle Blanks			0	0	0	1	1	2
Trip Blanks			0	0	0	0	0	0
Duplicates			2	2	2	1	1	2
TOTALS			42	42	42	21	21	35

* Section 5.0 of "Generic Quality Assurance Project Plan for RCRA Facility Investigations for the Los Alamos National Laboratory Environmental Restoration Program" (LANL 1991, 31294) includes US EPA SW-846 quantitative and detection limits for the various required analytes.

7.23 SWMU Aggregate S, Phase I

Aggregate S consists of SWMU Nos. 35-016(m, o, and p), which are outfalls from the northeastern section of TA-35. TA-35 is located along Pecos Drive, north of Pajarito Road, on an east-west-trending finger-like mesa of the Pajarito Plateau. SWMU Nos. 35-016(m and p) are cooling water outfalls that discharge into Mortandad Canyon from the south rim. SWMU No. 36-016(o) includes storm drains that also discharge into Mortandad Canyon.

SWMU No. 35-016(m) is an inactive outfall that originates from a cooling tower (TA-35-33). The outfall formerly had national pollutant discharge elimination system (NPDES) Permit No. 03A039. The permit was established in 1966 and deactivated in 1982. The water discharged into the outfall was treated to control scaling, corrosion, and algal growth (Radzinski 1991, 12459). The chemicals used to treat the water sometimes contained metals such as mercury, cadmium, or lead.

SWMU No. 35-016(o) includes several active storm drains established in 1951 to handle rainwater runoff from the original Ten Site laboratory and office building (TA-35-2). Floor-drain effluents from TA-35-2, in which radioactive and acidic liquids and drums of oil containing PCBs are handled, possibly discharge into this system. The storm drains travel 125 ft northward from TA-35-2 and discharge into Mortandad Canyon north of an office trailer (TA-35-261).

SWMU No. 35-016(p) is an unpermitted active cooling-water outfall that was established in 1968 to handle discharge from the Nuclear Safeguards Research Building (TA-35-27).

7.23.1 Sampling Plan Rationale and Objectives

The objective of this Phase I sampling plan is to determine the presence or absence of soil and sediment contamination from these outfalls. Over time contaminants in the water that was discharged from these drains may have concentrated in the soils below the outfalls. Sampling activities are biased toward areas where the concentration of any contaminants present in the outfalls may have occurred. The conceptual model for Aggregate S assumes the following.

- Contaminants may be present in the surface soils and sediments near the outfalls.
- Contaminants are likely to be detected in the surface soils and sediments of the discharge channel.
- Contaminants are likely to be most concentrated in the discharge channel and in sediment traps along the first-order drainages that intersect the main canyon channel. The scope of this Work Plan does not include the main canyon channel.
- The primary transport mechanism for contaminants in this aggregate is through surface and discharge runoff.

If contaminants are detected, surface migration will be considered, and a Phase II investigation will be conducted to determine the nature and extent of contamination at each site.

Decision logic for Phase I field investigation activities to be conducted at SWMU Aggregate S is presented in Figure 7-51.

7.23.2 Phase I Field Investigation Activities

An engineering survey of the SWMUs will be conducted to locate the sampling points in the drainage channels of these outfalls. Radiological surveys will be conducted to determine if contaminants may be present. Because atmospheric releases of radionuclides have occurred at this site and at TA-55, screening for radionuclides will be performed.

Two samples will be taken from each SWMU (Figure 7-52): a 3-ft auger hole and a surface sample. The 3-ft auger hole will be drilled into the discharge channel in an area where settlement is likely to occur to determine if contaminants may be concentrating beneath the surface. The purpose of the 3-ft sampling depth is to provide some information about contaminants discharged from the outfalls in the past. The 3-ft sampling depth is based on the conceptual model of contamination at these sites. One sample will be collected from each 1-ft interval beneath the surface and analyzed for metals and SVOCs. Because of the possibility of radionuclide releases in the past, all samples will be screened for gross-alpha, -beta, and -gamma. Subsurface samples collected from SWMU Nos. 35-016(o and p) will also be analyzed using gamma spectroscopy. Samples from SWMU No. 35-016(o) will also be analyzed for PCBs. All surface samples will be analyzed for metals; SVOCs; and gross-alpha, -beta, and -gamma. They will also be analyzed using gamma spectroscopy and alpha spectrometry. If water is present in any of these outfalls, a sample will be collected and analyzed for pH, specific conductance, and total metals.

7.23.3 Sample Screening and Analysis

Each soil sample will be screened for contact radiation using a scintillation detector. All sample packages will be screened for surface contamination and radiation. All samples will be analyzed for metals and SVOCs and screened for gross-alpha, -beta, and -gamma. All surface samples will also be analyzed using gamma spectroscopy and alpha spectrometry. Subsurface samples collected from SWMU Nos. 35-016(o and p) will also be analyzed using gamma spectroscopy. All samples collected from SWMU No. 35-016(o) will also be analyzed for PCBs. The samples to be collected and the analyses required for the Phase I investigation of Aggregate R are summarized in Table 7-26.

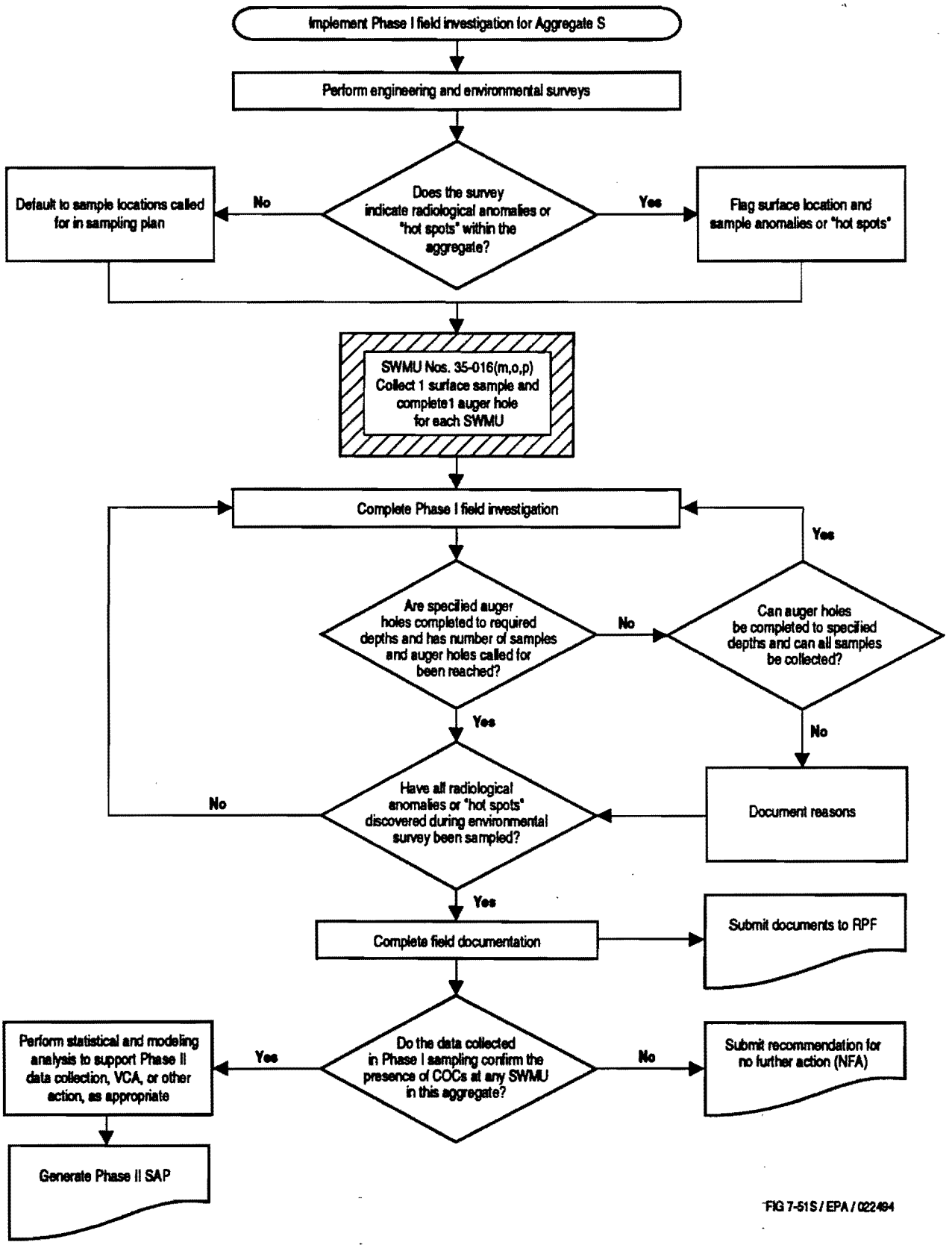


Figure 7-51. Decision logic for the sampling and analysis of SWMU Aggregate S.

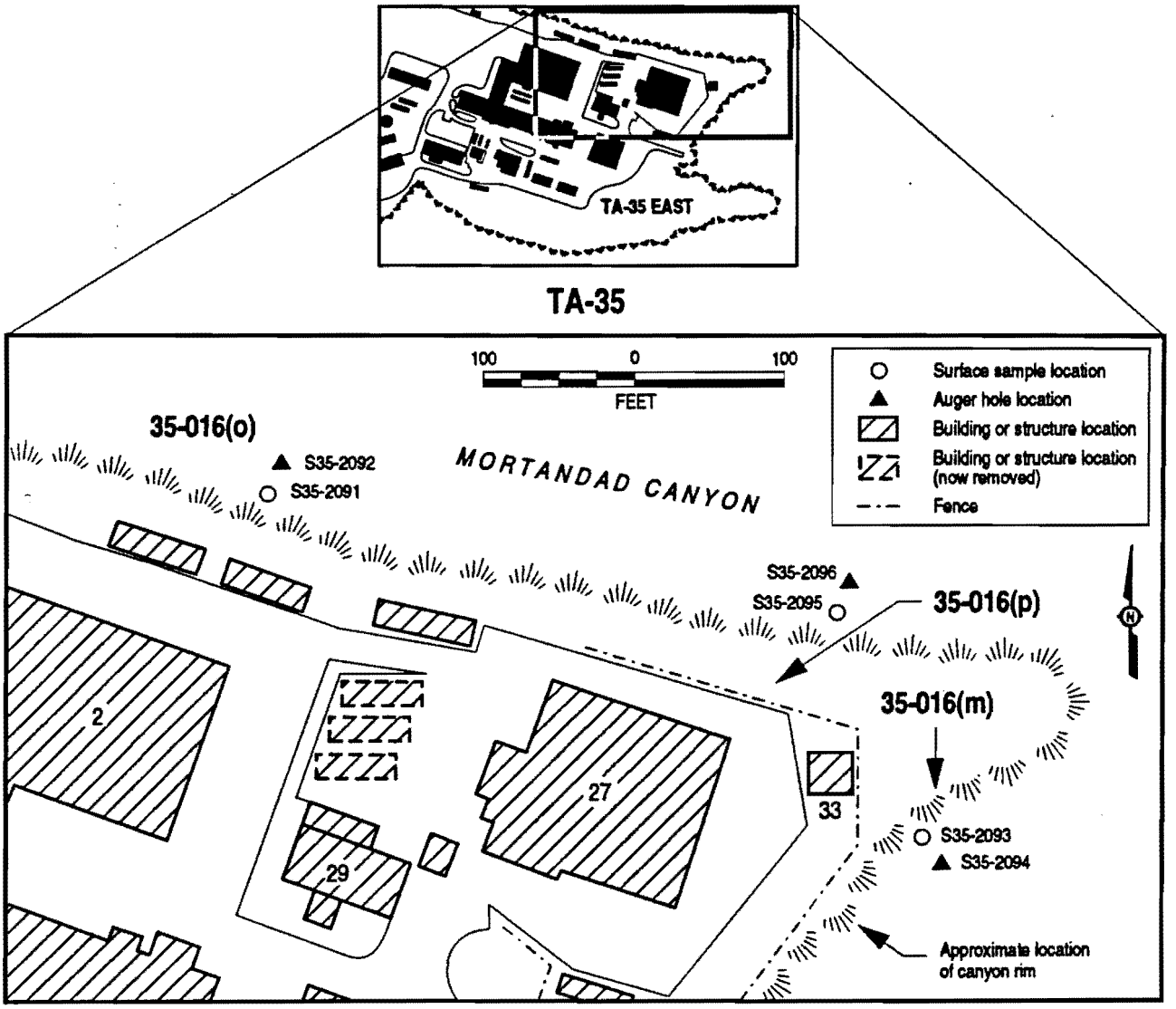


FIG 7-52[57] / EPA / 030494 ENG-R5117 (LANL 1986, 31438)

Figure 7-52. Schematic sample location map for SWMU Nos. 35-016(m, o, and p), Aggregate S.

TABLE 7-26

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE S

SWMU	SAMPLE NUMBER	DEPTH	Analyses Required *					
			Gross-alpha,-beta,-gamma	Gamma Spectroscopy	Alpha Spectrometry	Metals by XRF or ICPES	SVOCs	PCBs
35-016(m)	S35-2093-S1	Surface	1	1	1	1	1	0
	S35-2094-A1	0–12 in.	1	0	0	1	1	0
	S35-2094-A2	12–24 in.	1	0	0	1	1	0
	S35-2094-A3	24–36 in.	1	0	0	1	1	0
35-016(o)	S35-2091-S1	Surface	1	1	1	1	1	1
	S35-2092-A1	0–12 in.	1	1	0	1	1	1
	S35-2092-A2	12–24 in.	1	1	0	1	1	1
	S35-2092-A3	24–36 in.	1	1	0	1	1	1
35-016(p)	S35-2095-S1	Surface	1	1	1	1	1	0
	S35-2096-A1	0–12 in.	1	1	0	1	1	0
	S35-2096-A2	12–24 in.	1	1	0	1	1	0
	S35-2096-A3	24–36 in.	1	1	0	1	1	0
Rinsate Blanks			1	1	1	1	1	1
Bottle Blanks			0	0	0	1	1	1
Trip Blanks			0	0	0	0	0	0
Duplicates			1	1	1	1	1	1
TOTALS			14	11	5	15	15	7

* Section 5.0 of "Generic Quality Assurance Project Plan for RCRA Facility Investigations for the Los Alamos National Laboratory Environmental Restoration Program" (LANL 1991, 31294) includes US EPA SW-846 quantitative and detection limits for the various required analytes.

7.24 SWMU Aggregate T, Phase I

Aggregate T consists of SWMUs located at the southern and southeastern edges of TA-35 along Ten Site Canyon. SWMUs in this aggregate are SWMU Nos. 35-004(a, g, and h), SWMU No. 35-009(e), and SWMU Nos. 35-016(a, c, d, k, l, and q).

SWMU Nos. 35-004(a, g, and h) are container storage areas in which solvents, oils, and Freon have been stored. SWMU Nos. 35-004(a and g) are active storage areas; SWMU No. 35-004(h) is an inactive storage area. SWMU No. 35-004(a) is located southeast of the Sodium Building (TA-35-25); SWMU No. 35-004(g) is located on the south side of a warehouse (TA-35-67); and SWMU No. 35-004(h) is located on the northeast corner of the Air Filter Building (TA-35-7) (Figure 3-3). Soil stains have been noted at these sites, and samples collected from SWMU No. 35-004(g) contained detectable concentrations of metals, acetone, and low-alpha and -gamma activity (DOE 1987, 5622).

SWMU No. 35-009(e) is a drain line from TA-35-25 that discharges to an outfall in Ten Site Canyon, which is about 30 ft south of the building (LANL 1990, 7511). This drain does not pass through a septic tank or leach field. The status of this drain line is unknown.

SWMU Nos. 35-016(a, c, d, and k) are inactive outfalls that have handled noncontact cooling water. The outfall in SWMU No. 35-016(a) was established in 1958 to discharge noncontact cooling water from the Sodium Testing Building (TA-35-34). The drain line ran about 70 ft southward to its point of discharge into Ten Site Canyon (LANL 1990, 7511). The outfall, which formerly had NPDES Permit No. 04A089, was eliminated from the permit in 1985 (LANL 1985, 853). Two outfalls in SWMU No. 35-016(c) (former NPDES Permit Nos. 04A088 and 04A012) were established in 1964 to discharge noncontact cooling water from TA-35-67. The drain line to outfall 04A088 was combined with outfall 04A012 by 1985 (LANL 1985, 853). Outfall 04A012 ran about 125 ft from TA-35-67 to its point of discharge into Ten Site Canyon (LANL 1990, 7511). It was deactivated in 1987 (LANL 1990, 7511).

SWMU No. 35-016(d) is an outfall that was constructed in 1962 to handle noncontact cooling water from the Reactor Components Development Building (TA-35-46). This outfall, which formerly had NPDES Permit No. 04A087, was still listed as an active outfall in 1985. It is unknown when use of the outfall was discontinued. The drain line runs about 50 ft southward to its point of discharge into Ten Site Canyon (LANL 1990, 7511).

The outfall in SWMU No. 35-016(k) (former NPDES Permit No. 04A116) was installed in 1961 and deactivated in 1987 (LANL 1990, 7511). It handled sterilized water leaks from the ultraviolet water sterilizer in Room 001A and once-through cooling water from a closed heat-exchange system that served a gas laser in the Gas Laser Building (TA-35-29) (LANL 1991, 12451). During the 1988 ER Program site visit, the concrete catch basin for these drains had gamma radiation readings that measured 50% higher than background levels (LANL 1990, 7511). The drain line runs eastward and discharges into a shallow tributary of Ten Site Canyon that has been identified as SWMU No. 35-003(r).

SWMU No. 35-016(l) is an active daylight discharge channel that was established in 1961 to handle rainwater runoff from TA-35-29 and TA-35-7. The channels run eastward and discharge into a tributary of Ten Site Canyon (SWMU No. 35-003[r]).

SWMU No. 35-016(q) includes several active storm-water collection basins that are located between TA-35-34 and the edge of Ten Site Canyon. The basins have eroded into large gullies that drain southward into Ten Site Canyon. Three sediment

samples were collected from one of the basins as part of Environmental Problem 24 in the DOE Environment Survey (DOE 1987, 21510). The samples contained detectable quantities of metals, SVOCs, PCBs, and alpha- and gamma-emitting radioactive materials. No VOCs or beta emitters were present in detectable concentrations.

7.24.1 Sampling Plan Rationale and Objectives

The objective of this Phase I sampling plan is to determine if contaminants are present in these SWMUs. The following concepts were used to select sampling patterns for these SWMUs.

- Soil stains have been observed at the container storage areas. These stains will be investigated to determine if they are surficial or extensive and to determine if COCs are present. Soils atop the mesa are expected to have a thickness of 3 ft. Surface samples and shallow auger holes will be used to sample the soils.

- The outfalls will be investigated to determine if contaminants are present in the channels. Over time concentrations of contaminants may have seeped into the soils below the channels; therefore, shallow auger holes will be used to determine if this has occurred. Surface samples and shallow auger holes will be used to investigate the channels.

- The potential for surface migration of contaminants will be determined. Contaminants may be concentrated in storm drains in which surface runoff washed contaminants that had been spilled on paved areas.

If contaminants are detected in these areas, a Phase II investigation will be conducted to determine the nature and extent of contamination at each site.

Decision logic for Phase I field investigation activities to be conducted at SWMU Aggregate T is presented in Figure 7-53.

7.24.2 Phase I Field Investigation Activities

An engineering survey of the SWMUs will be conducted to locate sampling sites and will be used to implement initial radiation surveys. Radioactive contamination is not expected at all SWMUs in this aggregate, but screening will be performed at all sites. Surface samples from drainages that collect runoff over relatively larger source areas will be analyzed using gamma spectroscopy and alpha spectrometry.

Surface samples will be collected and shallow auger holes will be drilled in Aggregate T (Figure 7-54). Surface samples will be collected using stainless steel trowels. Shallow auger holes will be drilled through the soil profile to a depth of 3 ft or to bedrock, with a sample being collected at 1-ft intervals beneath the surface. If contamination is observed in the auger holes, sampling will continue until oil staining is no longer found or tuff is intersected, whichever is first.

Staining on the asphalt has been observed at SWMU Nos. 35-004(a, g, and h). These areas are covered with asphalt, but staining will be traced to the edge of the asphalt and samples will be collected at the edges. If staining is not visible at the edge of the asphalt, samples will be taken at breaks and cracks in the asphalt that show staining. Two surface samples will be collected, and a 3-ft auger hole will be drilled

at SWMU Nos. 35-004(a and g). These samples will be analyzed for metals; VOCs; SVOCs; PCBs; and gross-alpha, -beta, and -gamma. The surface samples will also be analyzed using gamma spectroscopy and alpha spectrometry.

SWMU No. 35-004(h) is covered with asphalt, and the runoff drains into the canyon designated as SWMU No. 35-003(r), which will be investigated with Aggregate D. Also, a sample collected for SWMU No. 35-003(misc.) in Aggregate D will characterize this asphalt-covered area. Because SWMU No. 35-004(h) will be examined with Aggregate D, no additional sampling is planned. Radiological and engineering surveys will be conducted to survey in features and delineate contaminated areas, if present.

Little is known about the outfall in SWMU No. 35-009(e). Two surface samples and three samples from a 3-ft-deep auger hole will be collected and analyzed for metals; VOCs; SVOCs; PCBs; and gross-alpha, -beta, and -gamma. The surface samples will be also be analyzed using gamma spectroscopy and alpha spectrometry.

A surface sample will be collected and a 3-ft-deep auger hole will be drilled in each of the cooling-water outfall channels in SWMU Nos. 35-016(a, c, d, and k). Samples from SWMU Nos. 35-016(a, c, and d) will be collected below the discharge point. Samples from SWMU No. 35-016(k) will be collected at the top of the culvert feeding into the canyon designated as SWMU No. 35-003(r). All samples will be analyzed for metals; VOCs; SVOCs; and gross-alpha, -beta, and -gamma. Surface samples will also be analyzed using gamma spectroscopy and alpha spectrometry.

Dielectric oil spills have occurred in SWMU No. 35-016(l), and gamma radiation higher than background has been detected in the concrete catch basin in this SWMU. The daylight channel drains into a topographic low and canyon designated as SWMU No. 35-003(r). These channels and much of the source area is asphalt; therefore, little material is available for sampling. However, an auger hole will be drilled in the discharge area of the daylight channel. One sample will be collected and analyzed for metals; VOCs; SVOCs; and gross-alpha, -beta, and -gamma. In addition, radiological and environmental surveys will be conducted in the area to delineate contaminated areas.

Six surface samples will be collected from the drainages in SWMU No. 35-016(q) where materials may have settled. These samples will be analyzed for metals; VOCs; SVOCs; PCBs; and gross-alpha, -beta, and -gamma. They will also be analyzed using gamma spectroscopy and alpha spectrometry.

7.24.3 Sample Screening and Analysis

Each soil sample will be screened for contact radiation using a scintillation detector. All sample packages will be screened for surface contamination and radiation. All samples will be analyzed for metals; VOCs; SVOCs; and gross-alpha, -beta, and -gamma. Surface samples will also be analyzed using gamma spectroscopy and alpha spectrometry. Samples from SWMU Nos. 35-004(a and g), SWMU No. 35-009(e), and SWMU No. 35-016(q) will also be analyzed for PCBs. The samples to be collected and the analyses required for the Phase I investigation of Aggregate T are summarized in Table 7-27.

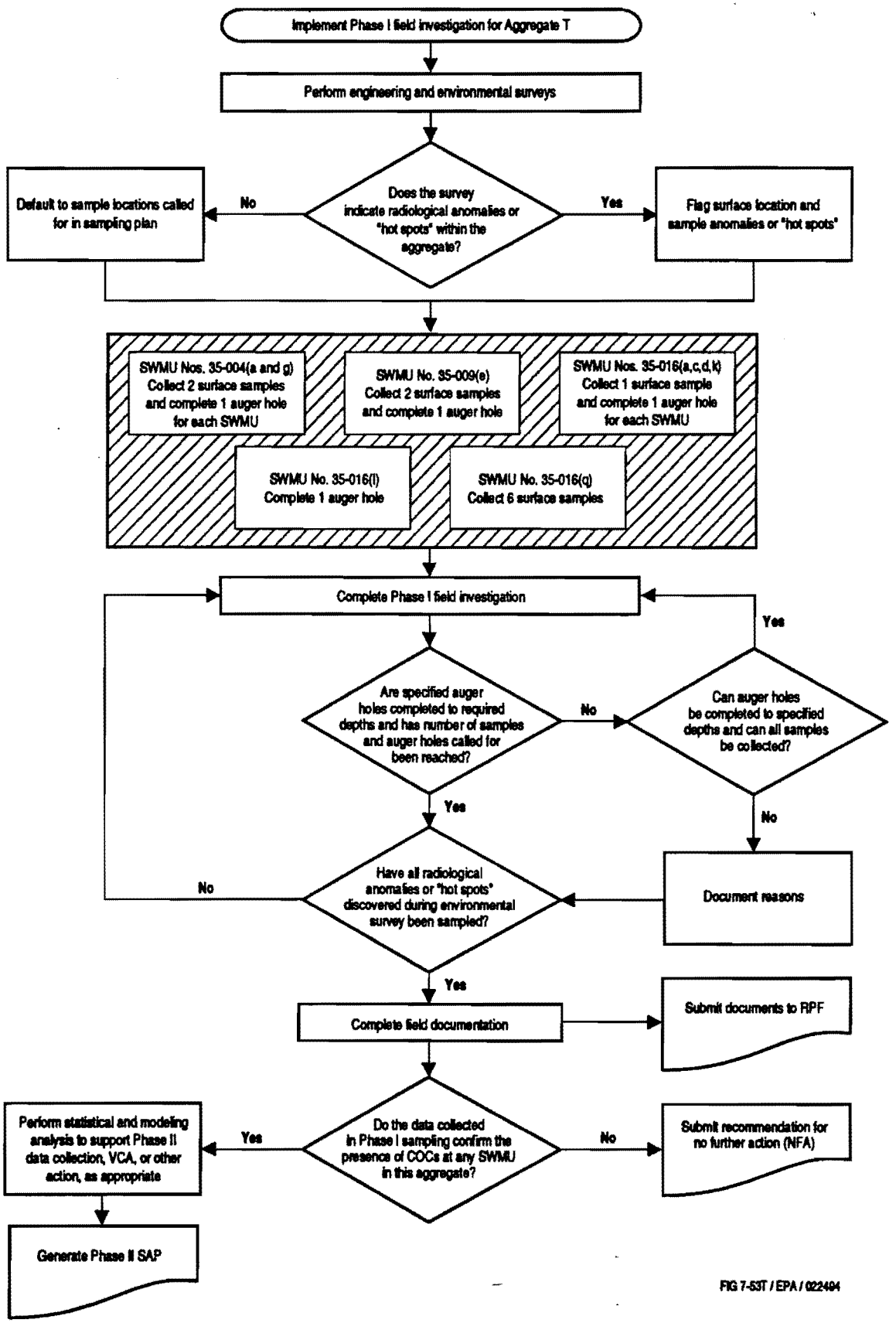


Figure 7-53. Decision logic for the sampling and analysis of SWMU Aggregate T.

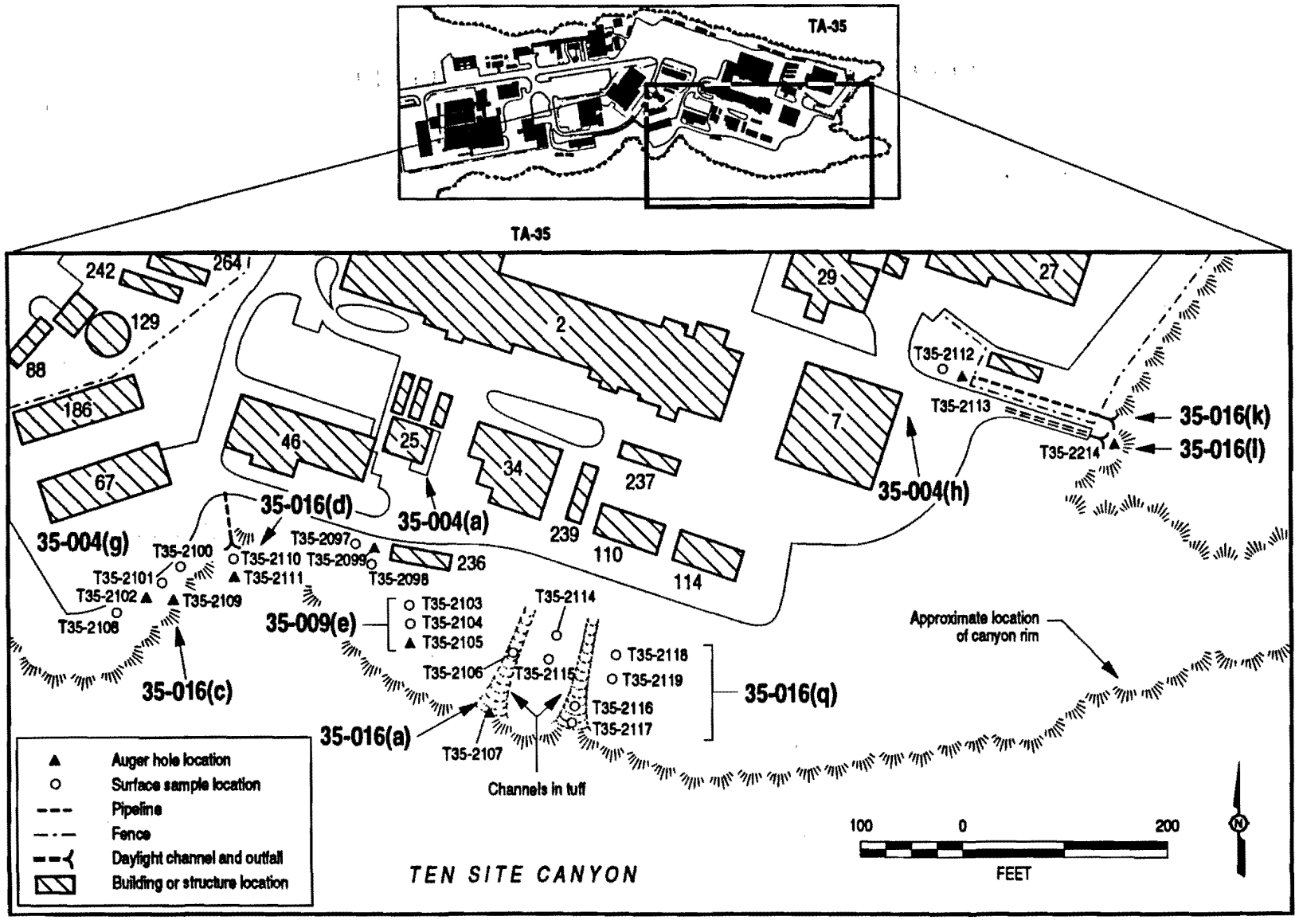


FIG 7-54[59] / EPA / 032494

ENG-R5117 (LANL 1986, 31438)

Figure 7-54. Schematic sample location map for SWMU Nos. 35-004(a, g, and h); 35-009(e); and 35-016(a, c, d, k, l, and q); Aggregate T.

TABLE 7-27

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE T

SWMU	SAMPLE NUMBER	DEPTH	Analyses Required *						
			Gross-alpha,-beta,-gamma	Gamma Spectroscopy	Alpha Spectrometry	Metals by XRF or ICPES	VOCs	SVOCs	PCBs
35-004(a)	T35-2097-S1	Surface	1	1	1	1	1	1	1
	T35-2098-S1	Surface	1	1	1	1	1	1	1
	T35-2099-A1	0–12 in.	1	0	0	1	1	1	1
	T35-2099-A2	12–24 in.	1	0	0	1	1	1	1
	T35-2099-A3	24–36 in.	1	0	0	1	1	1	1
35-004(g)	T35-2100-S1	Surface	1	1	1	1	1	1	1
	T35-2101-S1	Surface	1	1	1	1	1	1	1
	T35-2102-A1	0–12 in.	1	0	0	1	1	1	1
	T35-2102-A2	12–24 in.	1	0	0	1	1	1	1
	T35-2102-A3	24–36 in.	1	0	0	1	1	1	1
35-004 (h)**	D35-2024-B1	0–2 ft	1	1	1	1	1	1	1
35-009(e)	T35-2103-S1	Surface	1	1	1	1	1	1	1
	T35-2104-S1	Surface	1	1	1	1	1	1	1
	T35-2105-A1	0–12 in.	1	0	0	1	1	1	1
	T35-2105-A2	12–24 in.	1	0	0	1	1	1	1
	T35-2105-A3	24–36 in.	1	0	0	1	1	1	1
35-016(a)	T35-2106-S1	Surface	1	1	1	1	1	1	0
	T35-2107-A1	0–12 in.	1	0	0	1	1	1	0
	T35-2107-A2	12–24 in.	1	0	0	1	1	1	0
	T35-2107-A3	24–36 in.	1	0	0	1	1	1	0
35-016(c)	T35-2108-S1	Surface	1	1	1	1	1	1	0
	T35-2109-A1	0–12 in.	1	0	0	1	1	1	0
	T35-2109-A2	12–24 in.	1	0	0	1	1	1	0
	T35-2109-A3	24–36 in.	1	0	0	1	1	1	0
35-016(d)	T35-2110-S1	Surface	1	1	1	1	1	1	0
	T35-2111-A1	0–12 in.	1	0	0	1	1	1	0
	T35-2111-A2	12–24 in.	1	0	0	1	1	1	0
	T35-2111-A3	24–36 in.	1	0	0	1	1	1	0
35-016(k)	T35-2112-S1	Surface	1	1	1	1	1	1	0
	T35-2113-A1	0–12 in.	1	0	0	1	1	1	0
	T35-2113-A2	12–24 in.	1	0	0	1	1	1	0
	T35-2113-A3	24–36 in.	1	0	0	1	1	1	0
35-016 (l)***	T35-2214-A1	0–12 in.	1	0	0	1	1	1	0
35-016(q)	T35-2114-S1	Surface	1	1	1	1	1	1	1
	T35-2115-S1	Surface	1	1	1	1	1	1	1
	T35-2116-S1	Surface	1	1	1	1	1	1	1
	T35-2117-S1	Surface	1	1	1	1	1	1	1
	T35-2118-S1	Surface	1	1	1	1	1	1	1
	T35-2119-S1	Surface	1	1	1	1	1	1	1
Rinsate Blanks			2	1	1	2	2	2	2
Bottle Blanks			0	0	0	2	2	2	2
Trip Blanks			0	0	0	0	1	0	0
Duplicates			2	1	1	2	2	2	2
TOTALS			43	19	19	45	46	45	28

* Section 5.0 of "Generic Quality Assurance Project Plan for RCRA Facility Investigations for the Los Alamos National Laboratory Environmental Restoration Program" (LANL 1991, 31294) includes US EPA SW-846 quantitative and detection limits for the various required analytes.

** The discharge area of this SWMU will be sampled with Aggregate D.

***Additional samples in the discharge area of this SWMU will be collected during investigation in Aggregate D.

7.25 SWMU Aggregate U, Phase I

Aggregate U consists of SWMUs associated with the Target Fabrication Facility (TA-35-213) and the Chemical Laser Facility (TA-35-85), which are located on the northwestern side of TA-35. SWMU No. 35-004(b); SWMU Nos. 35-014(e_1, e_2, and f); and SWMU Nos. 35-016(e, f, g, h, and i) are included in this aggregate (Figure 3-4). These SWMUs are container storage areas, oil spills, and outfalls on the northwestern edge of the mesa bounded by Mortandad Canyon. SWMU No. 35-004(b); SWMU Nos. 35-014(e_1, e_2, and f); and SWMU Nos. 35-016(e, f, and i) are associated with TA-35-85 and the High-Voltage Development Laboratory (TA-35-188). These facilities use oil in processes inside the facility and have a number of oil tanks and associated connections.

SWMU No. 35-004(b) is a container storage area located at the northeastern corner of TA-35-85. The area has been used to store acetone, alcohol, solvents, oils, VOCs, and rags (LANL 1990, 7511).

SWMU Nos. 35-014(e_1 and e_2) are located north of TA-35-85. SWMU No. 35-014(e_1) is the site of a dielectric-oil spill. A forklift punctured a surface storage tank and caused the spill; the tank was removed before 1992. The quantity of oil spilled is unknown; however, site photos from May 1984 indicate that the spill flowed down the side of the mesa. The soils below the edge of the mesa are identified with a sign that says, "Do Not Remove. Contact Jay Wenzel, HSE-8." Trees that once grew below the edge of the mesa are dead. Cleanup efforts at this site have not been documented. SWMU No. 35-014(e_2) is an area stained by overflows from the decommissioned waste-oil impoundment (SWMU No. 35-005[a]), which is northeast of TA-35-85. Soil samples from these stained areas contained detectable concentrations of PCBs (LANL 1990, 7511).

SWMU No. 35-014(f) is the site of a dielectric-oil spill and is associated with a leaking dielectric-oil handling system connected to the outside east wall of TA-35-188. The system has since been removed. A compressor located near the northeast corner of TA-35-188 has oil-stained soils beneath it.

SWMU No. 35-016(e) is an inactive outfall established in 1977 to handle noncontact cooling water from TA-35-85. SWMU No. 35-016(f) is a storm drain on the northwest side of TA-35-85; SWMU No. 35-016(i) is a daylight channel that discharges from the northeastern end of TA-35 between the building and the parking lot. These drains discharge into Mortandad Canyon. Oil spills have occurred in the source areas for these drains (SWMU Nos. 35-014[e_1 and e_2] and SWMU No. 35-005[a]).

SWMU Nos. 35-016(g and h) are drains and outfalls associated with TA-35-213, adjacent to TA-50. SWMU No. 35-016(g) is an active outfall (NPDES Permit No. 04A127) that handles reverse-osmosis discharge from Room 29 in the basement of TA-35-213. This outfall now handles cooling-tower blowdown from that room (LANL 1991, 12451). The drain line runs about 100 ft northward to its point of discharge into Mortandad Canyon. This drain line may contain tritium (LANL 1990, 7511) and may also contain chemicals added to the cooling water to prevent corrosion, scaling, and algal growth. SWMU No. 35-016(h) includes several active storm drains designed to handle runoff from TA-35-213 and brine from the water deionizer (LANL 1991, 12451). The drains may also contain tritium. These drains run about 300 ft from the building to their point of discharge on the south rim of Mortandad Canyon.

The location of the outfalls for SWMU No. 35-016(h) are unknown. Although these outfalls are described as lying 300 ft from the building, maps in the 1990 SWMU

Report do not identify the proper location of these outfalls. Outfalls have not been found in the field at the location identified on the map, and a review of engineering drawings of TA-35-213 does not indicate that any outfalls were planned from the building to the area marked on the SWMU Report map (LANL 1990, 7511).

7.25.1 Sampling Plan Rationale and Objectives

The objective of this Phase I sampling plan is to determine the presence or absence of COCs in the vicinity of TA-35-213 and TA-35-85. A judgmental approach has been used to select sampling locations. Tritium may be present in outfalls from TA-35-213, but radionuclides are not expected at other sites in this aggregate. However, all samples will be screened for radionuclides.

SWMU No. 35-014(f) on the east side of TA-35-188 is the site of repeated releases of dielectric oil. The SWMU will be sampled to determine if COCs are present in the area of the spills. Because solvents and Freon are stored outside, samples will also be analyzed for VOCs, SVOCs, and PCBs.

The broad area north of TA-35-85 will be sampled for PCBs without segregating the areas of influence of each SWMU. Grid sampling will help locate AOCs because of the extent of the contaminated area. The sampling plan for the SWMUs behind TA-35-85 takes into consideration the following conceptual model.

- Mesa-top soils are expected to be approximately 3 ft deep with underlying fractured tuff bedrock.
- A spill on the mesa top would be expected to infiltrate surface soils and be mobilized by surface runoff to the adjacent edge of the mesa. Migration of contaminants through the bedrock of the mesa may have occurred through fractures, but this Phase I investigation will not explore for contaminated zones in the bedrock.
- The spill in SWMU No. 35-014(e_1) is known to have been extensive.

Spills in the area will have migrated through the soils. The sources of these spills have been removed, and new tanks have been constructed in the area. Areas behind TA-35-85 are saturated in hydrocarbons. If COCs are detected in these areas, the potential for migration will be considered, and a Phase II investigation will be conducted to determine the nature and extent of contamination at each site.

Decision logic for Phase I field investigation activities to be conducted at SWMU Aggregate U is presented in Figure 7-55.

7.25.2 Phase I Field Investigation Activities

An engineering survey of the SWMUs will be conducted to locate sampling points. A 120-ft by 360-ft grid on 30-ft centers will be used for the radiological and sampling surveys behind TA-35-85. The grid will be tied into corners of TA-35-85 so points can be referenced later. A radiological survey of each SWMU will also be conducted to determine if "hot spots" are present. If "hot spots" are detected, they will be sampled and analyzed using gamma spectroscopy and alpha spectrometry in addition to the analysis suite suggested for each particular SWMU.

Two sampling points will be selected in each drainage to determine if COCs are present in the surface or subsurface of the drainages. Water will be collected from drainages if it is present at the time of sampling. If COCs are present in the source areas of these drains, contaminants will be concentrated in the drainages. One auger hole will be drilled into each drainage to determine if contaminants may be present in the subsurface, and a surface sample will be collected to provide additional data.

Two auger holes will be drilled north of the storage area at SWMU No. 35-004(b). If staining is detected, it will be sampled; otherwise, two locations north of the storage area will be sampled by drilling 3-ft-deep auger holes. Samples will be collected at 1-ft intervals beneath the surface and analyzed for metals; VOCs; SVOCs; PCBs; and gross-alpha, -beta, and -gamma.

A total of 28 near-surface auger holes will be drilled from intercepts on the grid in the areas of SWMU Nos. 35-014(e_1 and e_2) (Figure 7-56). These holes will be 3 ft deep where possible, and samples will be collected at 1-ft intervals beneath the surface. If oil contamination is detected at the bottom of the hole, the hole will be extended until oil contamination is no longer detected or tuff is intersected, whichever is first. These samples will be analyzed for PCBs and gross-alpha, -beta, and -gamma. VOCs and SVOCs are not expected, but a few samples will be systematically selected and analyzed to confirm or deny the presence of these contaminants.

Two 3-ft-deep auger holes will be drilled east of TA-35-188 in SWMU No. 35-014(f) to determine if PCBs are present. (The area to be sampled is located between buildings, and accessibility to this area is cramped.) If contamination is detected at the bottom of the hole, the hole will be extended and sampled at 1-ft intervals beneath the surface until contamination is no longer detected. Samples will be collected at 1-ft intervals and analyzed for VOCs; SVOCs; PCBs; and gross-alpha, -beta, and -gamma.

In SWMU Nos. 35-016(e, f, and i), two sampling points will be selected along the discharge drainage for each SWMU where settlement and evaporation are likely to occur. At one location a surface sample will be collected; and at another location a 3-ft hand-augered hole will be drilled. Samples will be collected at 1-ft intervals beneath the surface. If oil contamination is detected at the bottom of the hole, the hole will be extended until contamination is no longer detected or bedrock is encountered. Samples will be analyzed for metals; VOCs; SVOCs; PCBs; and gross-alpha, -beta, and -gamma. If water is present in these drainages, a sample will be collected and analyzed for pH, specific conductance, and metals.

Discharge points in SWMU No. 35-016(g) adjacent to TA-35-213 will be sampled by collecting a surface sample and drilling a 3-ft-deep auger hole from locations along each discharge path where settlement and evaporation have occurred (Figure 7-57). Samples will be collected at 1-ft intervals beneath the surface and analyzed for metals; VOCs; SVOCs; tritium; and gross-alpha, -beta, and -gamma. If water is present, a sample will be collected and analyzed for pH, specific conductance, metals, and tritium.

The location of SWMU No. 35-016(h) is questionable; therefore, sampling the site is difficult. Seven surface samples will be collected from possible sites of SWMU No. 35-016(h). Three samples will be collected from drainages in the vicinity of the site marked on the SWMU Report map. Two samples will be collected from the drainages that direct surface runoff to the southeast of TA-35-213. These samples will be collected below the two culverts that lie beneath the dirt road northeast of the building. Samples will be analyzed for metals; VOCs; SVOCs; tritium; and gross-alpha,

-beta, and -gamma. If water is present in these drainages, a sample will be collected and analyzed for pH, specific conductance, metals, and tritium.

7.25.3 Sample Screening and Analysis

Each soil sample will be screened for contact radiation using a scintillation detector. All sample packages will be screened for surface contamination and radiation. All samples will be analyzed for gross-alpha, -beta, and -gamma. In addition, samples from SWMU No. 35-004(b) will be analyzed for metals, VOCs, SVOCs, and PCBs; samples from SWMU Nos. 35-014(e_1, e_2, and f) will be analyzed for PCBs; and systematically selected intervals from these SWMUs will be analyzed for VOCs and SVOCs. Samples from SWMU Nos. 35-016(e, f, and i) will be analyzed for metals, VOCs, SVOCs, and PCBs. Samples from SWMU Nos. 35-016(g and h) will also be analyzed for metals, VOCs, and SVOCs. Water samples collected in drainages will be analyzed for pH, specific conductance, and metals. The samples to be collected and the analyses required for the investigation of Aggregate U are summarized in Table 7-28.

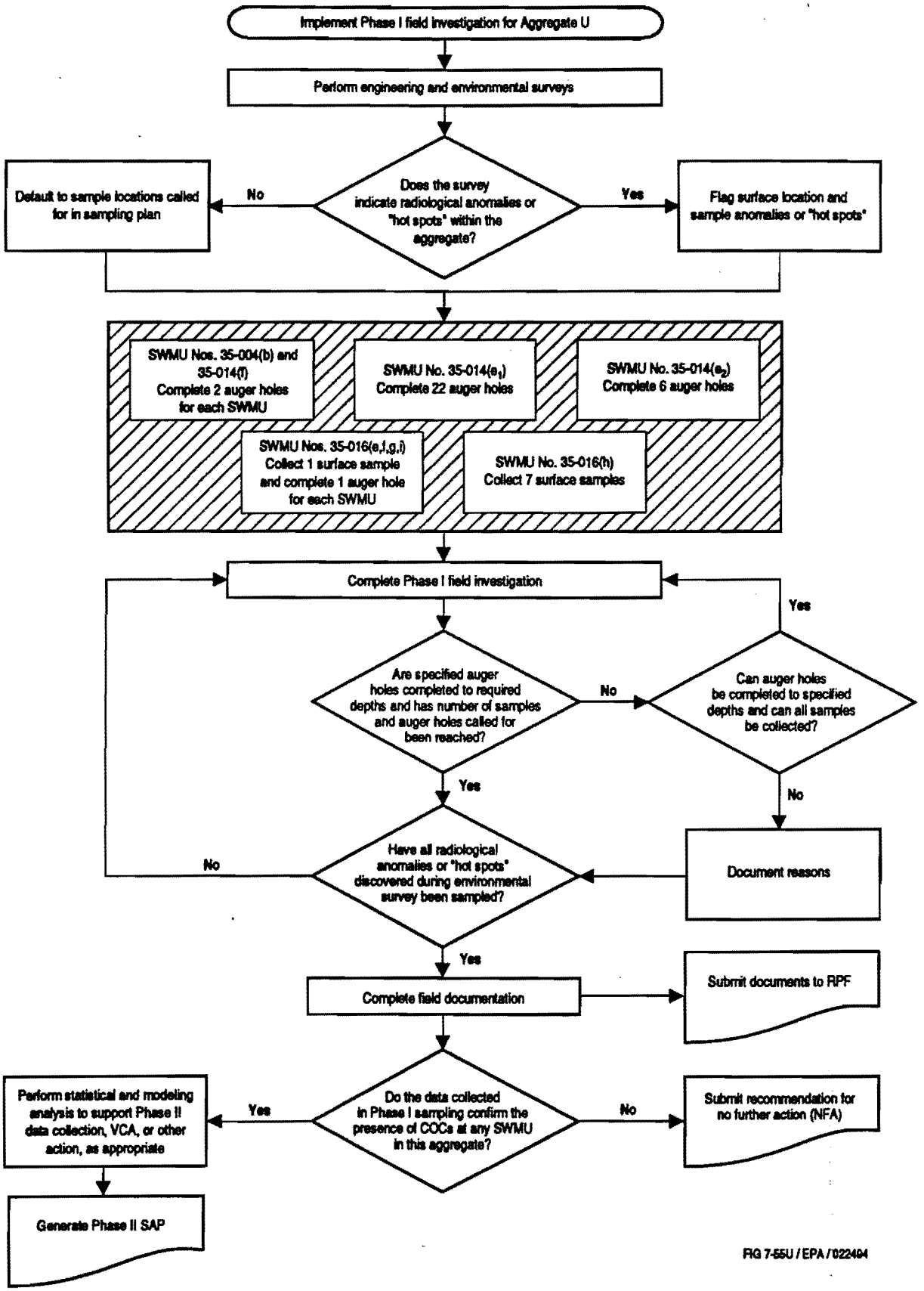


Figure 7-55. Decision logic for the sampling and analysis of SWMU Aggregate U.

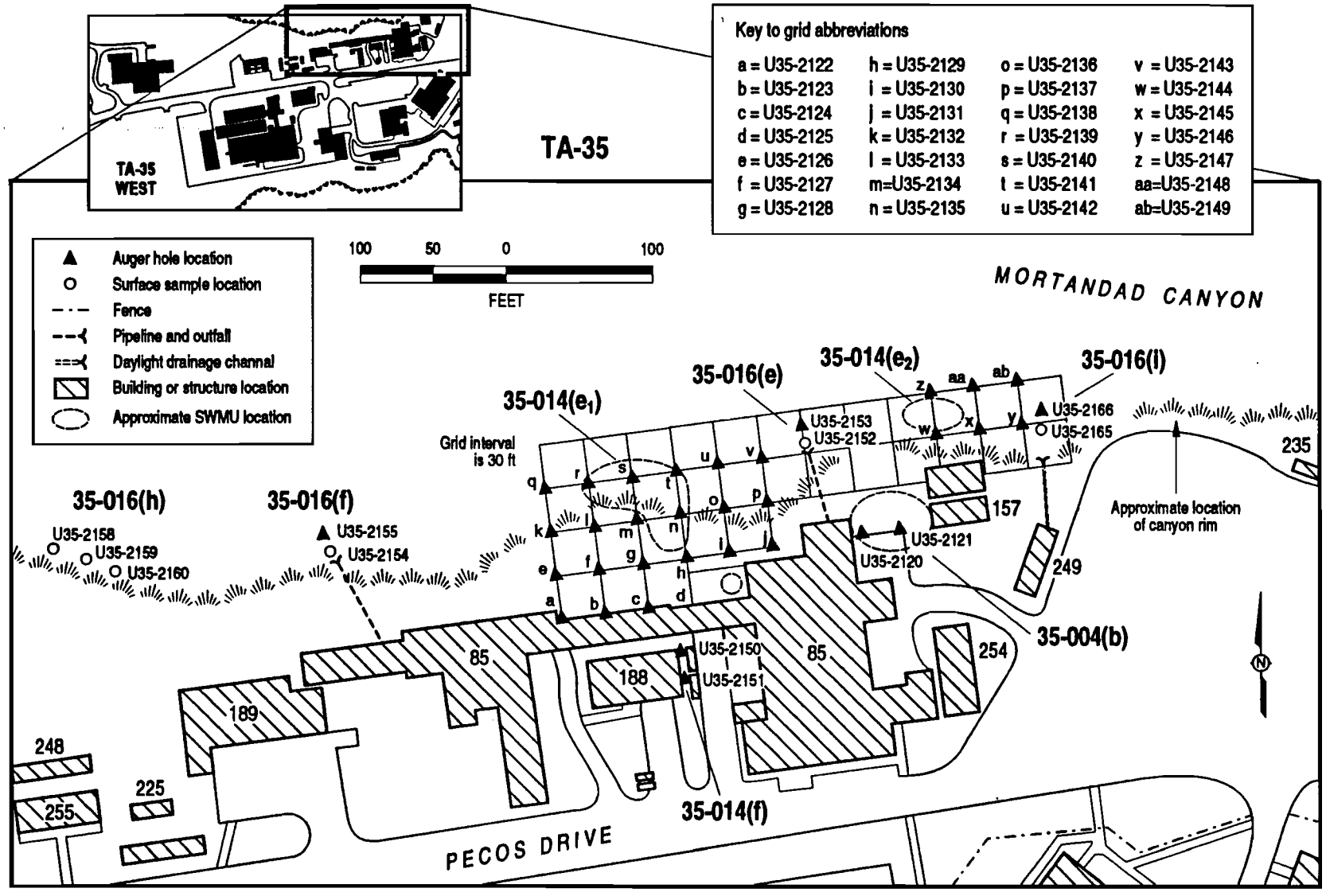


FIG 7-56[62-57] / EPA / 032394

ENG-R5117 (LANL 1986, 31438)

Figure 7-56. Schematic sample location map for SWMU Nos. 35-004(b); 35-014(e_1, e_2, and f); and 35-016(e, f, h, and l); Aggregate U.

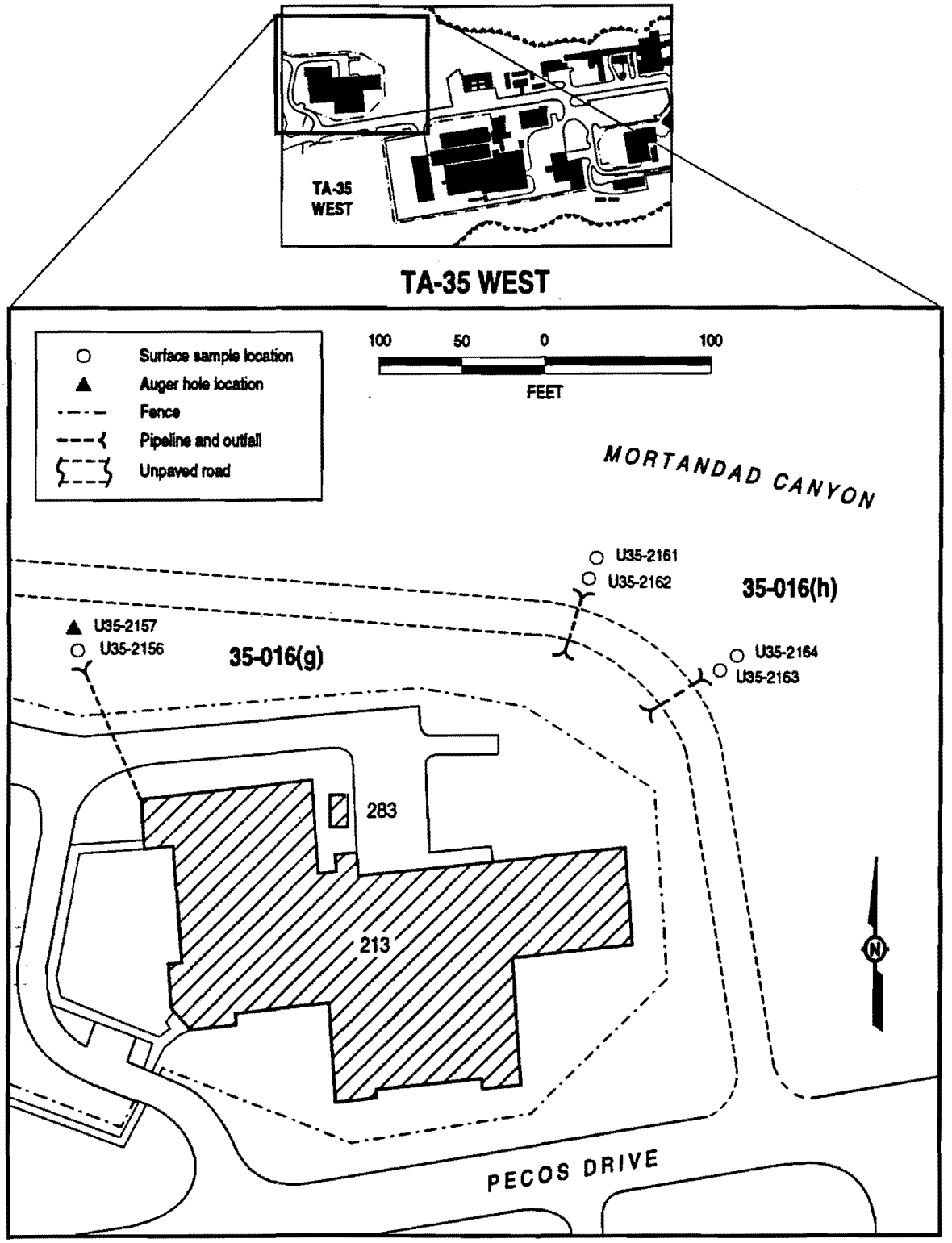


FIG 7-57[61-56] / EPA / 030794 ENG-R5117 (LANL 1986, 31438)

Figure 7-57. Schematic sample location map for SWMU Nos. 35-016(g and h), Aggregate U.

TABLE 7-28

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE U

SWMU	SAMPLE NUMBER	DEPTH	Analyses Required *					
			Gross-alpha,-beta,-gamma	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
35-004(b)	U35-2120-A1	0–12 in.	1	1	1	1	1	0
	U35-2120-A2	12–24 in.	1	1	1	1	1	0
	U35-2120-A3	24–36 in.	1	1	1	1	1	0
	U35-2121-A1	0–12 in.	1	1	1	1	1	0
	U35-2121-A2	12–24 in.	1	1	1	1	1	0
	U35-2121-A3	24–36 in.	1	1	1	1	1	0
35-014(e1)	U35-2122-A1	0–12 in.	1	0	1	1	1	0
	U35-2122-A2	12–24 in.	1	0	0	0	1	0
	U35-2122-A3	24–36 in.	1	0	0	0	1	0
	U35-2123-A1	0–12 in.	1	0	0	0	1	0
	U35-2123-A2	12–24 in.	1	0	0	0	1	0
	U35-2123-A3	24–36 in.	1	0	0	0	1	0
	U35-2124-A1	0–12 in.	1	0	0	0	1	0
	U35-2124-A2	12–24 in.	1	0	1	1	1	0
	U35-2124-A3	24–36 in.	1	0	0	0	1	0
	U35-2125-A1	0–12 in.	1	0	0	0	1	0
	U35-2125-A2	12–24 in.	1	0	0	0	1	0
	U35-2125-A3	24–36 in.	1	0	0	0	1	0
	U35-2126-A1	0–12 in.	1	0	0	0	1	0
	U35-2126-A2	12–24 in.	1	0	0	0	1	0
	U35-2126-A3	24–36 in.	1	0	1	1	1	0
	U35-2127-A1	0–12 in.	1	0	0	0	1	0
	U35-2127-A2	12–24 in.	1	0	0	0	1	0
	U35-2127-A3	24–36 in.	1	0	0	0	1	0
	U35-2128-A1	0–12 in.	1	0	1	1	1	0
	U35-2128-A2	12–24 in.	1	0	0	0	1	0
	U35-2128-A3	24–36 in.	1	0	0	0	1	0
	U35-2129-A1	0–12 in.	1	0	0	0	1	0
	U35-2129-A2	12–24 in.	1	0	0	0	1	0
	U35-2129-A3	24–36 in.	1	0	0	0	1	0
	U35-2130-A1	0–12 in.	1	0	0	0	1	0
	U35-2130-A2	12–24 in.	1	0	1	1	1	0
	U35-2130-A3	24–36 in.	1	0	0	0	1	0
	U35-2131-A1	0–12 in.	1	0	0	0	1	0
	U35-2131-A2	12–24 in.	1	0	0	0	1	0
	U35-2131-A3	24–36 in.	1	0	0	0	1	0
	U35-2132-A1	0–12 in.	1	0	0	0	1	0
	U35-2132-A2	12–24 in.	1	0	0	0	1	0
	U35-2132-A3	24–36 in.	1	0	1	1	1	0
	U35-2133-A1	0–12 in.	1	0	0	0	1	0
	U35-2133-A2	12–24 in.	1	0	0	0	1	0
	U35-2133-A3	24–36 in.	1	0	0	0	1	0
	U35-2134-A1	0–12 in.	1	0	1	1	1	0
	U35-2134-A2	12–24 in.	1	0	0	0	1	0
	U35-2134-A3	24–36 in.	1	0	0	0	1	0
	U35-2135-A1	0–12 in.	1	0	0	0	1	0
	U35-2135-A2	12–24 in.	1	0	0	0	1	0
	U35-2135-A3	24–36 in.	1	0	0	0	1	0
	U35-2136-A1	0–12 in.	1	0	0	0	1	0
	U35-2136-A2	12–24 in.	1	0	1	1	1	0
	U35-2136-A3	24–36 in.	1	0	0	0	1	0

TABLE 7-28 (continued)

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE U

SWMU	SAMPLE NUMBER	DEPTH	Analyses Required *					
			Gross-alpha,-beta,-gamma	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
35-014(e1) (continued)	U35-2137-A1	0–12 in.	1	0	0	1	1	0
	U35-2137-A2	12–24 in.	1	0	0	1	1	0
	U35-2137-A3	24–36 in.	1	0	0	1	1	0
	U35-2138-A1	0–12 in.	1	0	0	0	1	0
	U35-2138-A2	12–24 in.	1	0	0	0	1	0
	U35-2138-A3	24–36 in.	1	0	1	1	1	0
	U35-2139-A1	0–12 in.	1	0	0	0	1	0
	U35-2139-A2	12–24 in.	1	0	0	0	1	0
	U35-2139-A3	24–36 in.	1	0	0	0	1	0
	U35-2140-A1	0–12 in.	1	0	1	1	1	0
	U35-2140-A2	12–24 in.	1	0	0	0	1	0
	U35-2140-A3	24–36 in.	1	0	0	0	1	0
	U35-2141-A1	0–12 in.	1	0	0	0	1	0
	U35-2141-A2	12–24 in.	1	0	0	0	1	0
	U35-2141-A3	24–36 in.	1	0	0	0	1	0
	U35-2142-A1	0–12 in.	1	0	0	0	1	0
	U35-2142-A2	12–24 in.	1	0	1	1	1	0
	U35-2142-A3	24–36 in.	1	0	0	0	1	0
	U35-2143-A1	0–12 in.	1	0	0	0	1	0
	U35-2143-A2	12–24 in.	1	0	0	0	1	0
	U35-2143-A3	24–36 in.	1	0	0	0	1	0
35-014(e2)	U35-2144-A1	0–12 in.	1	0	0	0	1	0
	U35-2144-A2	12–24 in.	1	0	0	0	1	0
	U35-2144-A3	24–36 in.	1	0	1	1	1	0
	U35-2145-A1	0–12 in.	1	0	0	0	1	0
	U35-2145-A2	12–24 in.	1	0	0	0	1	0
	U35-2145-A3	24–36 in.	1	0	0	0	1	0
	U35-2146-A1	0–12 in.	1	0	1	1	1	0
	U35-2146-A2	12–24 in.	1	0	0	0	1	0
	U35-2146-A3	24–36 in.	1	0	0	0	1	0
	U35-2147-A1	0–12 in.	1	0	0	0	1	0
	U35-2147-A2	12–24 in.	1	0	0	0	1	0
	U35-2147-A3	24–36 in.	1	0	0	0	1	0
	U35-2148-A1	0–12 in.	1	0	0	0	1	0
	U35-2148-A2	12–24 in.	1	0	1	1	1	0
	U35-2148-A3	24–36 in.	1	0	0	0	1	0
	U35-2149-A1	0–12 in.	1	0	0	0	1	0
	U35-2149-A2	12–24 in.	1	0	0	0	1	0
	U35-2149-A3	24–36 in.	1	0	0	0	1	0
35-014(l)	U35-2150-A1	0–12 in.	1	0	1	1	1	0
	U35-2150-A2	12–24 in.	1	0	1	1	1	0
	U35-2150-A3	24–36 in.	1	0	1	1	1	0
	U35-2151-A1	0–12 in.	1	0	1	1	1	0
	U35-2151-A2	12–24 in.	1	0	1	1	1	0
	U35-2151-A3	24–36 in.	1	0	1	1	1	0
35-016(e)	U35-2152-S1	Surface	1	1	1	1	1	0
	U35-2153-A1	0–12 in.	1	1	1	1	1	0
	U35-2153-A2	12–24 in.	1	1	1	1	1	0
	U35-2153-A3	24–36 in.	1	1	1	1	1	0
35-016(l)	U35-2154-S1	Surface	1	1	1	1	1	0
	U35-2155-A1	0–12 in.	1	1	1	1	1	0
	U35-2155-A2	12–24 in.	1	1	1	1	1	0
	U35-2155-A3	24–36 in.	1	1	1	1	1	0

TABLE 7-28 (continued)

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE U

SWMU	SAMPLE NUMBER	DEPTH	Analyses Required *					
			Gross-alpha,-beta,-gamma	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
35-016(g)	U35-2156-S1	Surface	1	1	1	1	0	1
	U35-2157-A1	0–12 in.	1	1	1	1	0	1
	U35-2157-A2	12–24 in.	1	1	1	1	0	1
	U35-2157-A3	24–36 in.	1	1	1	1	0	1
35-016(h)	U35-2158-S1	Surface	1	1	1	1	0	1
	U35-2159-S1	Surface	1	1	1	1	0	1
	U35-2160-S1	Surface	1	1	1	1	0	1
	U35-2161-S1	Surface	1	1	1	1	0	1
	U35-2162-S1	Surface	1	1	1	1	0	1
	U35-2163-S1	Surface	1	1	1	1	0	1
	U35-2164-S1	Surface	1	1	1	1	0	1
35-016(i)	U35-2165-S1	Surface	1	1	1	1	1	0
	U35-2166-A1	0–12 in.	1	1	1	1	1	0
	U35-2166-A2	12–24 in.	1	1	1	1	1	0
	U35-2166-A3	24–36 in.	1	1	1	1	1	0
Rinsate Blanks			6	2	3	3	6	1
Bottle Blanks			6	2	3	3	6	1
Trip Blanks			0	0	1	0	0	0
Duplicates			6	2	3	3	6	1
TOTALS			137	35	59	61	126	14

* Section 5.0 of "Generic Quality Assurance Project Plan for RCRA Facility Investigations for the Los Alamos National Laboratory Environmental Restoration Program" (LANL 1991, 31294) includes US EPA SW-846 quantitative and detection limits for the various required analytes.

7.26 SWMU Aggregate V, Phase I

Aggregate V consists of SWMUs along the southeastern edge of TA-35 adjacent to Ten Site Canyon. It is also the site of a transformer near the Gas Laser Building (TA-35-29). TA-35 is located along Pecos Drive, north of Pajarito Road, on an east-west-trending finger-like mesa of the Pajarito Plateau. TA-35 is situated east of TAs -50 and -55 and north of TAs -63 and -52. SWMUs in this aggregate are SWMU No. 35-004(m); SWMU Nos. 35-014(g_1, g_2, and g_3); SWMU No. 35-015(a); SWMU Nos. 35-016(b, j, and n); and SWMU No. 35-018(a).

A decommissioned tank farm and waste-oil treatment system was formerly located on the west side of the Carbon Dioxide Laser Building (TA-35-86). The decommissioned tank farm is identified as SWMU No. 35-015(a). In 1985 samples taken in the region of the oil siege tanks indicated no PCB contamination, and oily soils have been removed from the area. Nearby are SWMU No. 35-004(m), SWMU Nos. 35-014(g_1, g_2, and g_3), and SWMU No. 35-016(n). Spills from the tank farm were discharged into a storm sewer and into Ten Site Canyon near the Experimental Support Laboratory (TA-35-207) (LANL 1990, 7511). These spills are identified as SWMU No. 35-016(n). SWMU No. 35-014(g_3) is the site of a major spill that occurred at the tank farm in 1986. The spill flowed southward through a culvert under the road on the south side of TA-35-86, across a parking lot west of TA-35-207, down an embankment between storage tanks TA-35-278 and TA-35-279, and southward across the mesa through a natural drainage pathway into Ten Site Canyon. The trace of the spill is clearly visible in a 1986 aerial photograph. In 1987 (LANL 1990, 7511) eleven samples were collected along the trace of the spill to the canyon bottom and 100 ft downstream as part of DOE Environmental Problem 25 (DOE 1987, 21511). Metals, pesticides with PCBs, alpha and gamma emitters, SVOCs, and VOCs were detected in the samples (LANL 1990, 7511). The stained area from this spill was observed in August 1991 and still smelled strongly of oil. All vegetation in the path of the spill was dead (Roberson 1991, 21576).

SWMU No. 35-004(m) and SWMU No. 35-014(g_2) are located in an inactive container storage area. These SWMUs exhibit a stained asphalt area near the fence on the south side of TA-35-86 where solvents, Freon, oil, and rags were stored.

SWMU No. 35-014(g_1) is reported to be a 4-ft by 2-ft wide stain in the discharge area of a storm drain system located near the northeast corner of TA-35-207 that coincides with SWMU No. 35-016(n) (LANL 1990, 7511). This SWMU consists of a storm drain outfall and a catchment basin area that discharge south of TA-35-86. An oil spill occurred previously at the catchment basin.

Samples taken from an area stained by a spill at SWMU No. 35-014(g_3) contained detectable quantities of several contaminants (LANL 1990, 7511). Therefore, similar contamination is expected in stained areas at this site.

SWMU No. 35-016(b) is an active outfall (NPDES Permit No. 06A132) that was established in 1977 to discharge photographic processing effluents from a Laboratory office building (TA-35-87) into Ten Site Canyon. The waste is passed through a silver and cyanide recovery process before entering the drain lines of TA-35-87. Effluent is limited to 3000 gal./day and is sampled for silver and cyanide under NPDES requirements (LANL 1990, 7511).

SWMU No. 35-016(j) includes active storm drains installed in 1975 to handle rainwater runoff from the Antares Carbon Dioxide Laser Building (TA-35-125) and

electro-polishing wastewater from Room B102 in TA-35-125 (LANL 1991, 12451). The channels run southward to their points of discharge into Ten Site Canyon.

SWMU No. 35-018(a) is the site of a transformer (PCB ID No. 5024) at the Transformer Substation (TA-35-32) near the southwest corner of TA-35-29 that was reported to be leaking PCB-contaminated dielectric oil. The transformer was dripping onto a porous concrete pad with no spill containment and no drip pan. The extent of the release to the underlying pad and surrounding soil is unknown.

7.26.1 Sampling Plan Rationale and Objectives

The objective of this Phase I sampling plan is to determine the presence or absence of soil contamination in this aggregate. The oil spills west and south of TA-35-86 will be sampled to determine if solvents or PCBs are present. Samples will be taken in the drainages below SWMU Nos. 35-016(b and j) to determine whether COCs have been discharged into the drains and whether metals are concentrating in the soils below the discharges. Sampling activities are directed toward areas where residual contamination is most likely to be present. The spills in this aggregate are expected to have permeated the soils and perhaps migrated into joints and cracks in underlying bedrock. Samples of soils will be collected and analyzed for COCs, but sampling will not be pursued into bedrock because the objective of this Phase I investigation is only to confirm or deny the presence of contaminants.

The area of the decommissioned tank farm west of TA-35-86 drains to the southwest. Much of the area of the tank farm has been covered with either concrete or asphalt, which is restricting the migration of contaminants into the environment. Over the years, contaminants from spills in the tank farm area probably have concentrated in the drainage to the southwest. The large spill designated SWMU No. 35-014(g_3), which reportedly contains contaminants, flowed though this area into Mortandad Canyon. Smaller spills and surface runoff from the tank farm also will have concentrated in this drainage. The drainage will be sampled to represent spills from the tank farm. Sampling will also be performed to determine the level of contaminants present in the path of the major spill in SWMU No. 35-014(g_3) and to gather some information about whether residual contaminant concentrations vary in the direction of the canyon. The results of the DOE Environmental Problem 25 sampling have not been located; therefore, resampling is necessary. Sample results will determine whether further investigation of the spill that flowed down Ten Site Canyon is warranted.

High levels of radionuclides are not expected to be present in this area. However, all surface samples and subsurface samples from the first 1-ft interval will be screened for gross-alpha, -beta, and -gamma because airborne radionuclides have been released at TAs -35 and -55; radionuclide contamination from these discharges may be widespread. One sample from each SWMU will be analyzed using gamma spectroscopy and alpha spectrometry to determine if radioactive contaminants are present and, if so, which contaminants are present.

Contaminants released in effluents and by local surface water runoff are likely to concentrate in the sediments below the storm drains designated as SWMU Nos. 35-016(b and j).

SWMU No. 35-018(a) will be sampled to determine if PCBs or other COCs are present in the area of the oil spill. The spill in this area is expected to have permeated

the soils. If COCs were present in the spill, enough residual contamination will remain to confirm or deny the presence of contaminants in this area.

If contaminants are detected in any of these areas, the potential for surface migration will be considered, and a Phase II investigation will be conducted to determine the nature and extent of contamination at each site.

Decision logic for Phase I field investigation activities to be conducted at SWMU Aggregate V is presented in Figure 7-58.

7.26.2 Phase I Field Investigation Activities

An engineering survey of the SWMUs will be conducted to locate the extent of surface oil stains, the path of drainages, and locations for sampling. A 30-ft grid pattern will be used to sample the exposed area in SWMU No. 35-015(a) (Figure 7-59). The corners of TA-35-86 and the fence will be surveyed in to assist in relocating sample locations later.

Shallow auger holes will be drilled through the soil profile to a depth of 3 ft or to bedrock. Samples will be collected at 1-ft intervals beneath the surface. If staining is observed in samples collected from the 3-ft interval of soil, sampling will continue until staining is no longer observed or tuff is intersected, whichever is first.

Surface samples will be collected between the surface and a depth of 6 in. using a stainless steel trowel. If radiation is detected in an area during the field surveys or during sampling, the surface of that area will be sampled. One surface sample from each sample location cluster designated here will also be analyzed using gamma spectroscopy and alpha spectrometry.

The location of SWMU No. 35-004(m) and SWMU No. 35-014(g_2) will be sampled in the vicinity of the former storage area (now the site of dumpsters) southeast of TA-35-86 (Figure 7-59). One surface sample will be collected, and one auger hole will be drilled. The auger hole will be drilled to a depth of 3 ft, and samples will be collected at 1-ft intervals beneath the surface. The sampling locations will be selected from observed areas of staining. These samples will be analyzed for metals; VOCs; SVOCs; PCBs; and gross-alpha, -beta, and -gamma. The surface sample will also be analyzed using gamma spectroscopy and alpha spectrometry.

Two surface samples will be collected and an auger hole will be drilled at the location marked on the SWMU Report maps as SWMU No. 35-014(g_1) and SWMU No. 35-016(n), which are east of TA-35-207. The 3-ft auger hole will be drilled on the east side of TA-35-207 at the storm drain discharge point. Samples will be collected at 1-ft intervals beneath the surface. All samples will be analyzed for metals; VOCs; SVOCs; PCBs; and gross-alpha, -beta, and -gamma. They will also be analyzed using and gamma spectroscopy. One surface sample will also be analyzed using alpha spectrometry.

Six surface samples will be collected in SWMU No. 35-014(g_3). Four of the samples will be collected along the major zone of staining that leads into Ten Site Canyon. One sampling location will be selected from stains on the east side of the drainage, and one sampling location will be selected from stains on the west side. These samples will be analyzed for metals; VOCs; SVOCs; PCBs; and gross-alpha, -beta, and -gamma. One surface sample will also be analyzed using gamma spectroscopy and alpha spectrometry.

Eleven locations west of TA-35-86 will be sampled in SWMU No. 35-015(a). Four shallow auger holes will be drilled, four surface samples will be collected at the intercepts of a 20-ft grid, and three surface samples will be collected in drainages (Figure 7-59). All samples will be analyzed for metals; VOCs; SVOCs; and gross-alpha, -beta, and -gamma. The top interval of each sample location will also be analyzed for PCBs. One surface sample will also be analyzed using gamma spectroscopy and alpha spectrometry.

For SWMU Nos. 35-016(b and j), one surface sample will be collected and one 3-ft auger hole will be drilled in each SWMU. All samples will be analyzed for metals; VOCs; SVOCs; and gross-alpha, -beta, and -gamma. The surface samples will also be analyzed using gamma spectroscopy and alpha spectrometry.

One surface sample will be collected and two 3-ft auger holes will be drilled in SWMU No. 35-018(a). The auger holes will be located near the southwest corner of TA-35-29 (Figure 7-60) where TA-35-32 is located. One auger hole will be drilled in the north side of TA-35-32, the other in the southeast side. Samples will be collected from each 1-ft interval beneath the surface. All samples will be analyzed for metals; VOCs; SVOCs; PCBs; and gross-alpha, -beta, and -gamma. The surface sample will also be analyzed using gamma spectroscopy and alpha spectrometry.

7.26.3 Sample Screening and Analysis

Each soil sample will be screened for contact radiation using a scintillation detector. All sample packages will be screened for surface contamination and radiation. The soil samples will be analyzed for metals; VOCs; SVOCs; and gross-alpha, -beta, and -gamma. All samples from SWMU No. 35-004(m); SWMU Nos. 35-014(g_1, g_2, and g_3); SWMU No. 35-016(n); and SWMU No. 35-015(a) will also be analyzed for PCBs. A surface sample from each cluster of sampling locations will be analyzed using gamma spectroscopy and alpha spectrometry, except for SWMU No. 35-016(n), in which all samples will also be analyzed using gamma spectroscopy. Samples to be collected and the analyses required for the Phase I investigation of Aggregate V are summarized in Table 7-29.

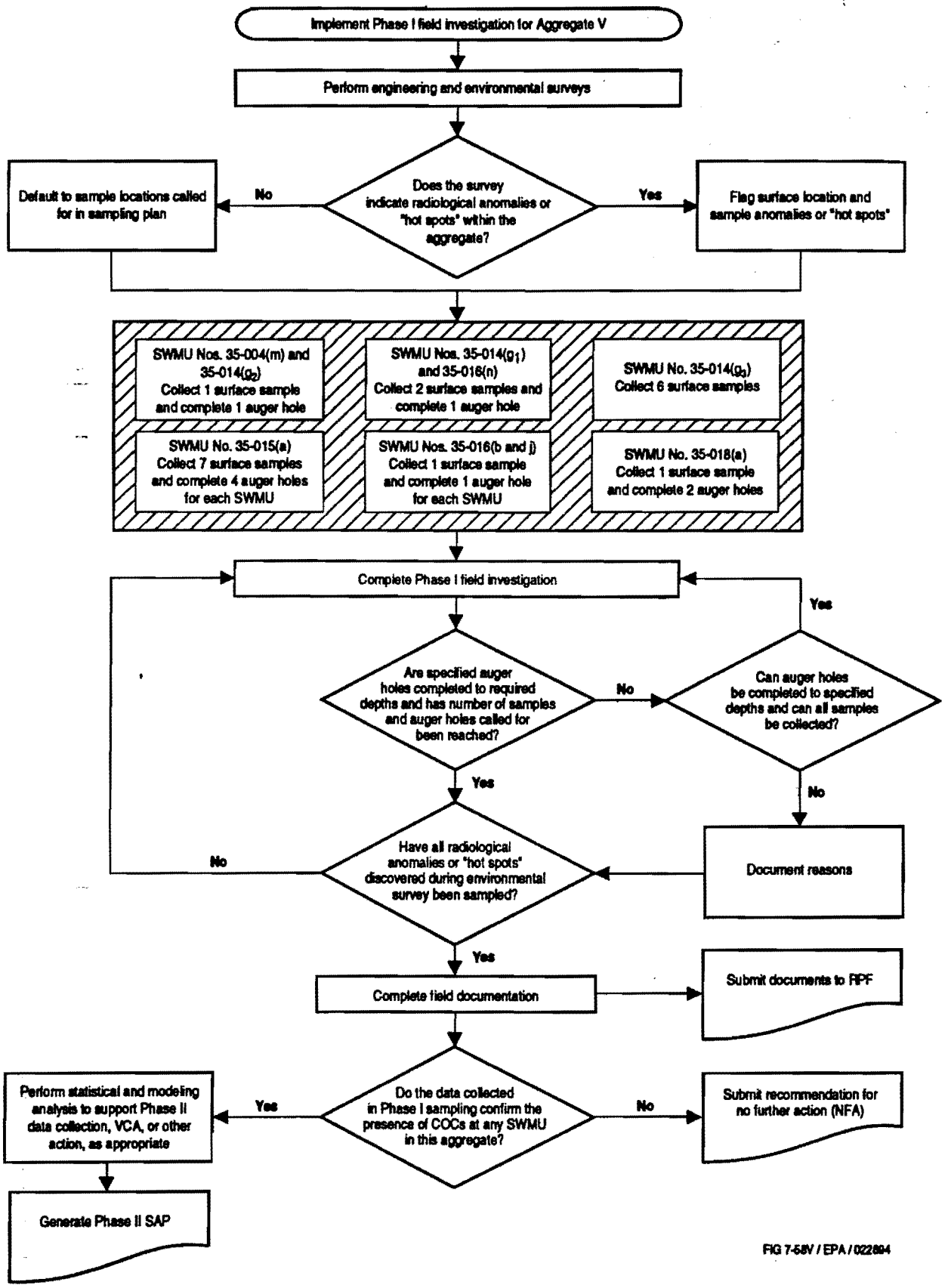


Figure 7-58. Decision logic for the sampling and analysis of SWMU Aggregate V.

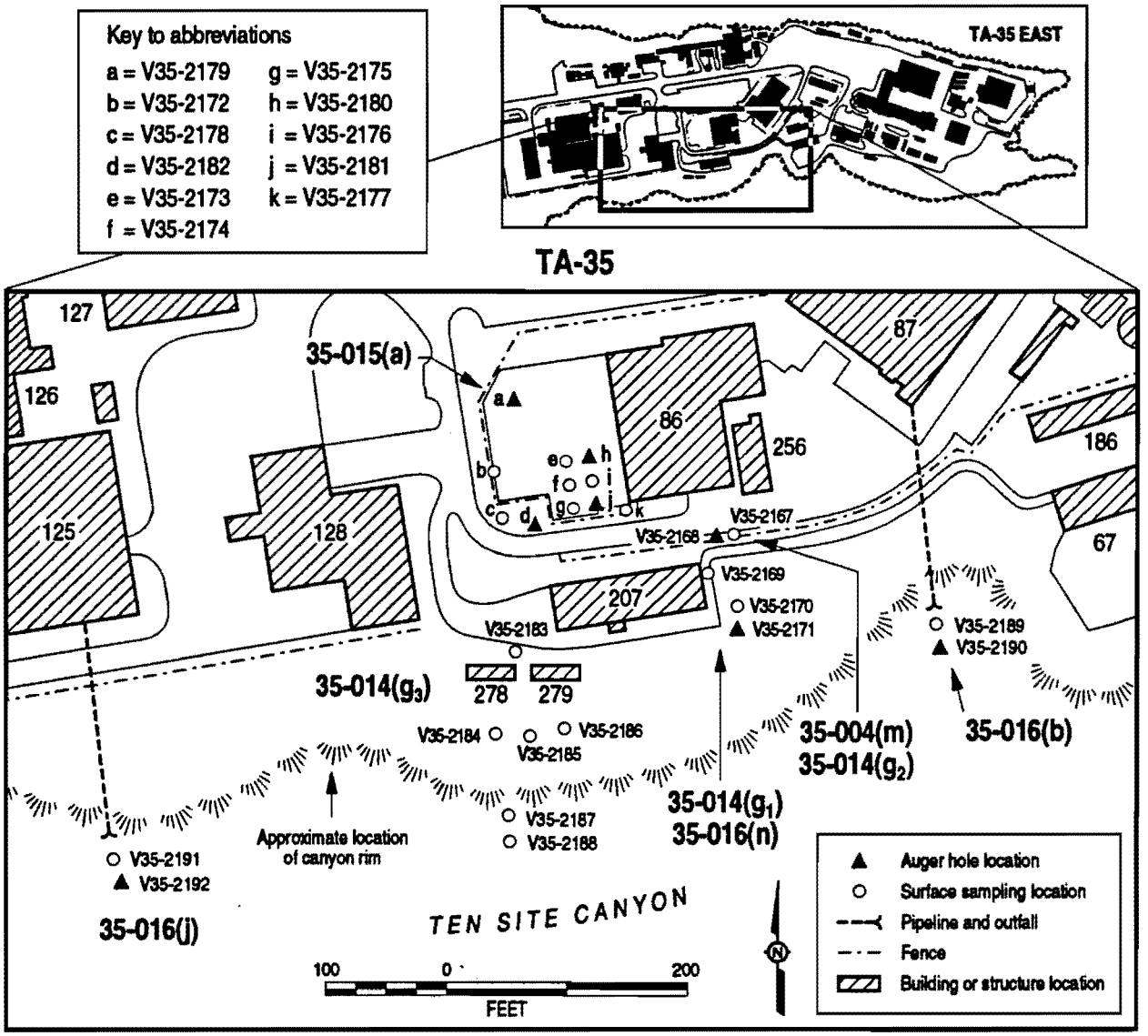


FIG 7-59[64] / EPA / 031694 ENG-R5117 (LANL 1986, 31438)

Figure 7-59. Schematic sample location map for SWMU Nos. 35-014(m); 35-014(g_1, g_2, and g_3); 35-015(a); and 35-016(b, j, and n); Aggregate V.

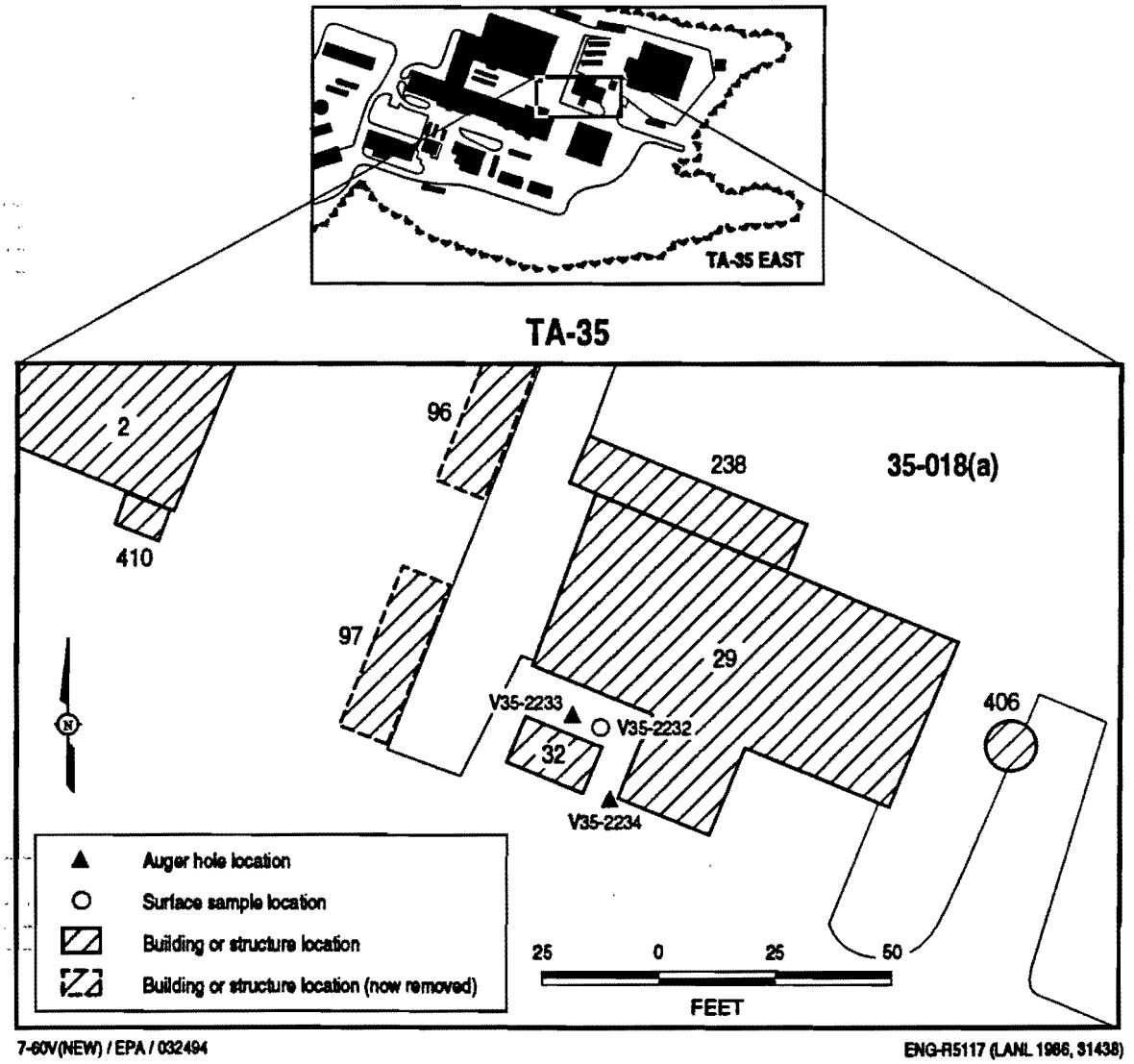


Figure 7-60. Schematic sample location map for SWMU No. 35-018(a), Aggregate V.

TABLE 7-29

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE V

SWMU	SAMPLE NUMBER	DEPTH	Analyses Required *						
			Gross-alpha,-beta,-gamma	Gamma Spectroscopy	Alpha Spectrometry	Metals by XRF or ICPES	VOCs	SVOCs	PCBs
35-004 (m) and 35-014(g2)	V35-2167-S1	Surface	1	1	1	1	1	1	1
	V35-2168-A1	0–12 in.	1	0	0	1	1	1	1
	V35-2168-A2	12–24 in.	1	0	0	1	1	1	1
	V35-2168-A3	24–36 in.	1	0	0	1	1	1	1
35-014 (g1) and 35-016(n)	V35-2169-S1	Surface	1	1	1	1	1	1	1
	V35-2170-S1	Surface	1	1	0	1	1	1	1
	V35-2171-A1	0–12 in.	1	1	0	1	1	1	1
	V35-2171-A2	12–24 in.	1	1	0	1	1	1	1
	V35-2171-A3	24–36 in.	1	1	0	1	1	1	1
35-014(g3)	V35-2183-S1	Surface	1	0	0	1	1	1	1
	V35-2184-S1	Surface	1	0	0	1	1	1	1
	V35-2185-S1	Surface	1	1	1	1	1	1	1
	V35-2186-S1	Surface	1	0	0	1	1	1	1
	V35-2187-S1	Surface	1	0	0	1	1	1	1
	V35-2188-S1	Surface	1	0	0	1	1	1	1
35-015(a)	V35-2172-S1	Surface	1	0	0	1	1	1	1
	V35-2173-S1	Surface	1	0	0	1	1	1	1
	V35-2174-S1	Surface	1	1	1	1	1	1	1
	V35-2175-S1	Surface	1	0	0	1	1	1	1
	V35-2176-S1	Surface	1	0	0	1	1	1	1
	V35-2177-S1	Surface	1	0	0	1	1	1	1
	V35-2178-S1	Surface	1	0	0	1	1	1	1
	V35-2179-A1	0–12 in.	1	0	0	1	1	1	1
	V35-2179-A2	12–24 in.	1	0	0	1	1	1	0
	V35-2179-A3	24–36 in.	1	0	0	1	1	1	0
	V35-2180-A1	0–12 in.	1	0	0	1	1	1	1
	V35-2180-A2	12–24 in.	1	0	0	1	1	1	0
	V35-2180-A3	24–36 in.	1	0	0	1	1	1	0
	V35-2181-A1	0–12 in.	1	0	0	1	1	1	1
	V35-2181-A2	12–24 in.	1	0	0	1	1	1	0
	V35-2181-A3	24–36 in.	1	0	0	1	1	1	0
	V35-2182-A1	0–12 in.	1	0	0	1	1	1	1
	V35-2182-A2	12–24 in.	1	0	0	1	1	1	0
	V35-2182-A3	24–36 in.	1	0	0	1	1	1	0
35-016(b)	V35-2189-S1	Surface	1	1	1	1	1	1	0
	V35-2190-A1	0–12 in.	1	0	0	1	1	1	0
	V35-2190-A2	12–24 in.	1	0	0	1	1	1	0
	V35-2190-A3	24–36 in.	1	0	0	1	1	1	0
35-016(j)	V35-2191-S1	Surface	1	1	1	1	1	1	0
	V35-2192-A1	0–12 in.	1	0	0	1	1	1	0
	V35-2192-A2	12–24 in.	1	0	0	1	1	1	0
	V35-2192-A3	24–36 in.	1	0	0	1	1	1	0
35-018(a)	V35-2232-S1	Surface	1	1	1	1	1	1	1
	V35-2233-A1	0–12 in.	1	0	0	1	1	1	1
	V35-2233-A2	12–24 in.	1	0	0	1	1	1	1
	V35-2233-A3	24–36 in.	1	0	0	1	1	1	1
	V35-2234-A1	0–12 in.	1	0	0	1	1	1	1
	V35-2234-A2	12–24 in.	1	0	0	1	1	1	1
	V35-2234-A3	24–36 in.	1	0	0	1	1	1	1
Rinsate Blanks			3	1	1	3	3	3	2
Bottle Blanks			0	0	0	3	3	3	2
Trip Blanks			0	0	0	0	1	0	0
Duplicates			3	1	1	3	3	3	2
TOTALS			55	13	9	58	59	58	39

* Section 5.0 of "Generic Quality Assurance Project Plan for RCRA Facility Investigations for the Los Alamos National Laboratory Environmental Restoration Program" (LANL 1991, 31294) includes US EPA SW-846 quantitative and detection limits for the various required analytes.

7.27 SWMU Aggregate W, Phase I

Aggregate W consists of SWMU Nos. 35-010(d and e) and AOC No. C-35-007. SWMU Nos. 35-010(d and e) are associated with the water-treatment lagoons at TA-35 that were previously discussed in Sections 3.3.2 and 7.11. SWMU No. 35-010(d) is four sand filters, and SWMU No. 35-010(e) is the discharge headwall of the waste-treatment system that was installed in 1980. The 100-ft by 45-ft sand filters are plastic-lined (LANL 1990, 7511). Liquid effluent flows through the sand filters to NPDES Outfall 10S in Ten Site Canyon. It is not known if the sand filters have released contaminants to the underlying soil and sediment or if potentially hazardous substances have been released at the sand-filter outfall. The lagoons are scheduled for decommissioning when the Laboratory-wide sanitary wastewater consolidation system waste lines become operational. A limited Phase I investigation will be implemented to determine if contamination is present.

AOC No. C-35-007 is the site of an unknown spilled material observed over an area extending 0.25 mile on a dirt road east of the lagoons. The spilled material was reported on June 27, 1988, when it was observed to be killing vegetation. A spill report filed on July 1, 1988, indicated that a composite sample had been collected and corrective actions were pending the analytical results. No records of the source, analytical results, or corrective action were found.

7.27.1 Sampling Plan Rationale and Objectives

The objective of this Phase I sampling plan is to determine if RCRA-listed contaminants are migrating into the environment from the sand filters in SWMU No. 35-010(d), if they are concentrating in the soils below the sand-filter outfall in SWMU No. 35-010(e), and if COCs are present in the spill in AOC No. C-35-007. The outflow from the sand filters is monitored, but over time contaminants may be concentrating in the soils below the outfall. Sampling activities are directed toward areas where contamination might be present.

The linings of the sand filters are not known to be leaking, but the purpose of this Phase I investigation is to confirm this without disrupting the subsurface beneath the sand filters. This sampling plan is based on a conceptual model that will evaluate the possibility that contaminants contained in the effluent released to the sand filters could migrate down the hydraulic gradient through the soils in this area. Contaminants could flow along the surface of the bedrock and could be detected down the hydraulic gradient by sampling the soils. Samples collected from the lagoons in Aggregate G will provide information about which contaminants are present in the treatment system.

The possibility that contaminants could flow vertically below the sand filters and migrate into fractures will not be evaluated in this investigation. The probability of locating the fractures involved would be low, whereas the probability of increasing the mobility of possible contaminants under the sand filters would be high if intrusive methods are used. The sand filters are scheduled to be decommissioned, and a more thorough investigation will be conducted at that time.

Minimal information is available about the location of AOC No. C-35-007. No information is available about what was spilled.

Decision logic for Phase I field investigation activities to be conducted at SWMU Aggregate W is presented in Figure 7-61.

7.27.2 Phase I Field Investigation Activities

An engineering survey of the SWMUs will be conducted to locate the sand filters and sampling points. A radiological survey will be conducted to assess the conditions of the areas because radioactive contaminants may be present in the waste-treatment system and atmospheric releases have occurred at TA-35.

Two auger holes will be drilled through the soil south of the sand filters to underlying bedrock to sample SWMU No. 35-010(d) (Figure 7-62). Samples will be collected at 1-ft intervals beneath the surface and analyzed for metals; VOCs; SVOCs; PCBs; and gross-alpha, -beta, and -gamma. These samples will also be analyzed using gamma spectroscopy and alpha spectrometry.

Two surface samples will be collected and one auger hole will be drilled in SWMU No. 35-010(e). The surface samples will be collected along the discharge channel. The auger hole will be drilled through the soil to underlying bedrock and sampled at 1-ft intervals beneath the surface. All samples will be analyzed for metals; VOCs; SVOCs; PCBs; and gross-alpha, -beta, and -gamma. These samples will also be analyzed using gamma spectroscopy and alpha spectrometry.

A detailed map of the canyon below the water-treatment plant (Figure 7-63) will be developed during the engineering survey to show major drainage channels, rills, gullies, and seeps or wetlands. Twelve surface samples will be collected to determine if the spill reported in AOC No. C-35-007 can be located. A judgmental approach will be used in sampling the roads east of the lagoons. Three locations will be selected on one side of the southern road that leads to the sand filters. One location between the southern and northern roads north of the sand filters will also be sampled. Six locations, staggered on both sides of the northern road for a distance of 0.25 mile, will be sampled (Figure 7-63). Each sample location will be surveyed. A judgmental approach will be used to select sample locations. Two samples will be collected from the canyon drainage 0.25 mile from the lagoon. All samples will be analyzed for metals; SVOCs; PCBs; and gross-alpha, -beta, and -gamma. These samples will also be analyzed using gamma spectroscopy and alpha spectrometry.

7.27.3 Sample Screening and Analysis

Each soil sample will be screened for contact radiation using a scintillation detector. All sample packages will be screened for surface contamination and radiation. The samples will be analyzed for metals; SVOCs; PCBs; and gross-alpha, -beta, and -gamma. These samples will also be analyzed using gamma spectroscopy and alpha spectrometry. Samples near the sand filters will also be analyzed for VOCs. The samples to be collected and the analyses required for the Phase I investigation of Aggregate W are summarized in Table 7-30.

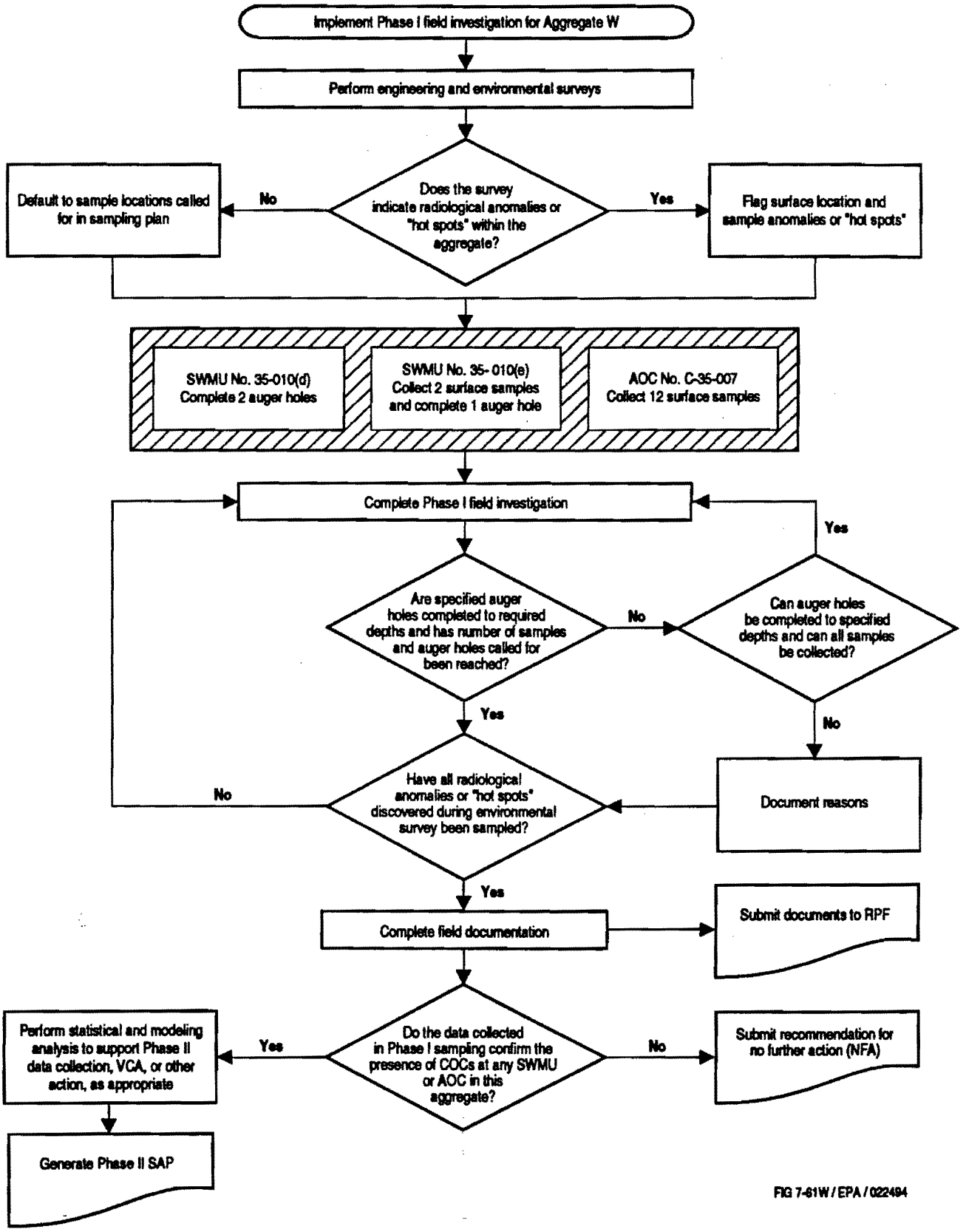


Figure 7-61. Decision logic for the sampling and analysis of SWMU Aggregate W.

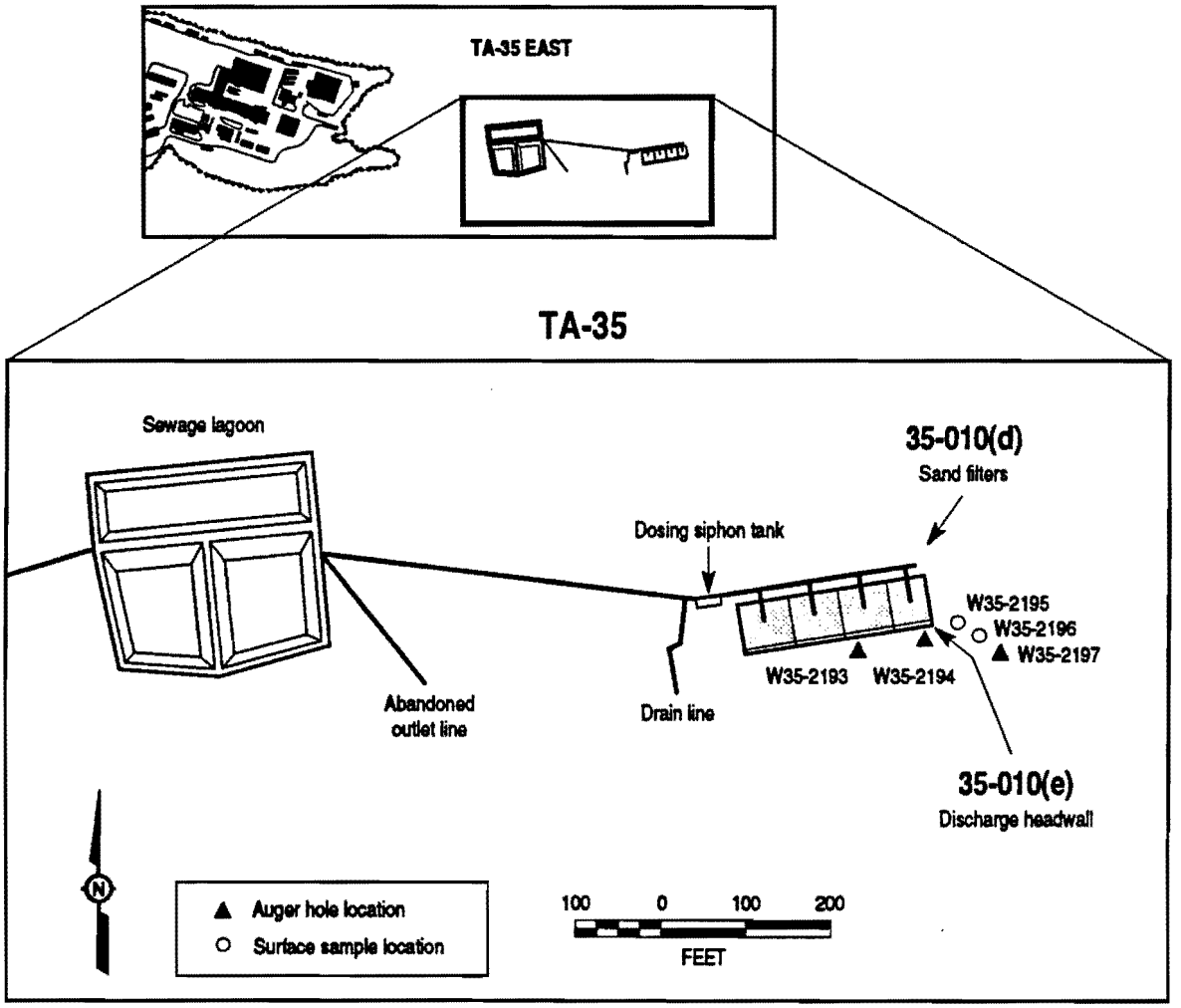


FIG 7-62[66] / EPA / 032494 ENG-R5117 (LANL 1986, 31438)

Figure 7-62. Schematic sample location for SWMU Nos. 35-010(d and e), Aggregate W.

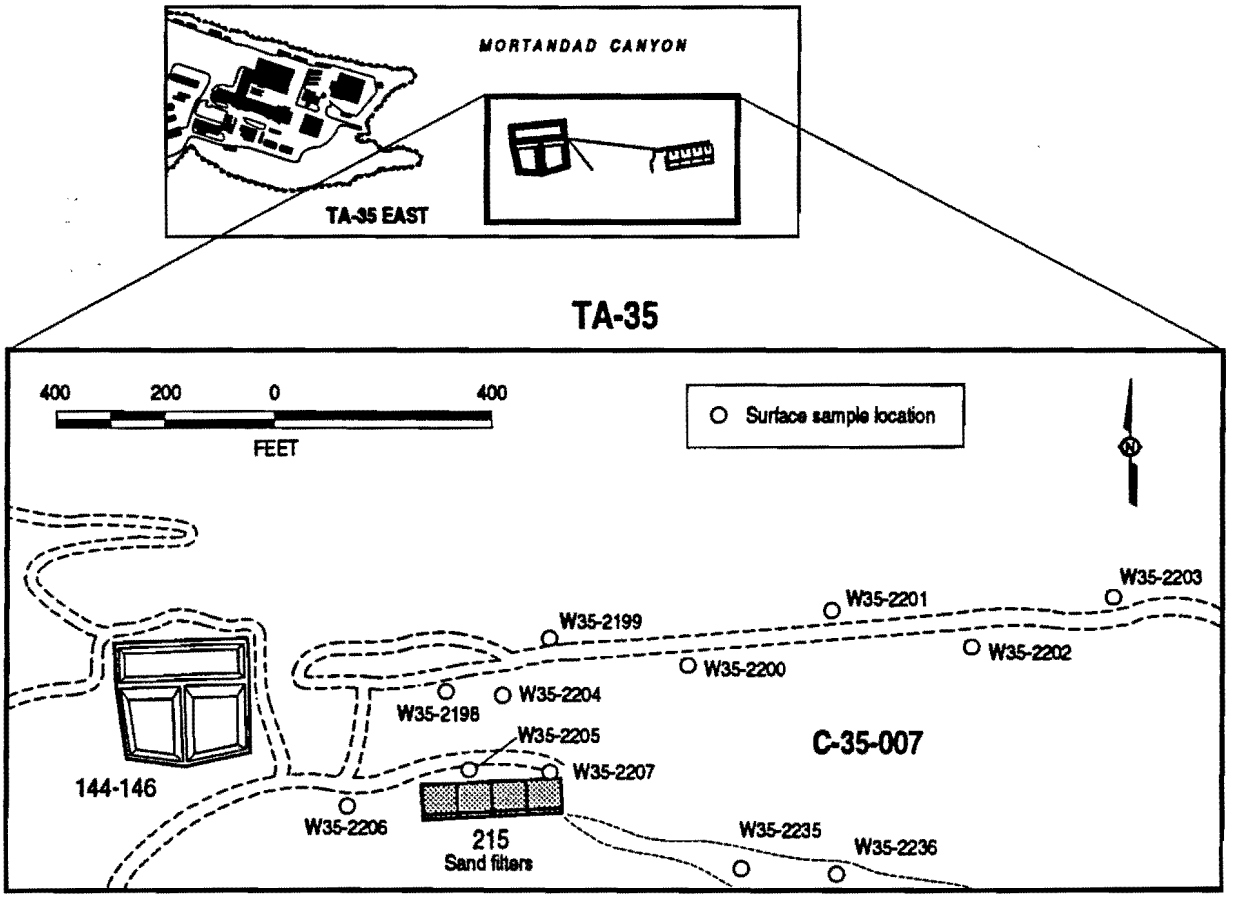


FIG 7-63[67] / EPA / 032494 ENG-R5117 (LANL 1986, 31438)

Figure 7-63. Schematic sample location for AOC No. C-35-007, Aggregate W.

TABLE 7-30

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE W

SWMU/AOC	SAMPLE NUMBER	DEPTH	Analyses Required *						
			Gross-alpha,-beta,-gamma	Gamma Spectroscopy	Alpha Spectrometry	Metals by XRF or ICPES	VOCs	SVOCs	PCBs
C-35-007	W35-2198-S1	Surface	1	1	1	1	0	1	1
	W35-2199-S1	Surface	1	1	1	1	0	1	1
	W35-2200-S1	Surface	1	1	1	1	0	1	1
	W35-2201-S1	Surface	1	1	1	1	0	1	1
	W35-2202-S1	Surface	1	1	1	1	0	1	1
	W35-2203-S1	Surface	1	1	1	1	0	1	1
	W35-2204-S1	Surface	1	1	1	1	0	1	1
	W35-2205-S1	Surface	1	1	1	1	0	1	1
	W35-2206-S1	Surface	1	1	1	1	0	1	1
	W35-2207-S1	Surface	1	1	1	1	0	1	1
	W35-2235-S1	Surface	1	1	1	1	0	1	1
	W35-2236-S1	Surface	1	1	1	1	0	1	1
35-010(d)	W35-2193-A1	0–12 in.	1	1	1	1	1	1	1
	W35-2193-A2	12–24 in.	1	1	1	1	1	1	1
	W35-2193-A3	24–36 in.	1	1	1	1	1	1	1
	W35-2194-A1	0–12 in.	1	1	1	1	1	1	1
	W35-2194-A2	12–24 in.	1	1	1	1	1	1	1
	W35-2194-A3	24–36 in.	1	1	1	1	1	1	1
35-010(e)	W35-2195-S1	Surface	1	1	1	1	1	1	1
	W35-2196-S1	Surface	1	1	1	1	1	1	1
	W35-2197-A1	0–12 in.	1	1	1	1	1	1	1
	W35-2197-A2	12–24 in.	1	1	1	1	1	1	1
	W35-2197-A3	24–36 in.	1	1	1	1	1	1	1
Rinsate Blanks			2	2	2	2	1	2	2
Bottle Blanks			0	0	0	2	1	2	2
Trip Blanks			0	0	0	0	1	0	0
Duplicates			2	2	2	2	1	2	2
TOTALS			27	27	27	29	15	29	29

* Section 5.0 of "Generic Quality Assurance Project Plan for RCRA Facility Investigations for the Los Alamos National Laboratory Environmental Restoration Program" (LANL 1991, 31294) includes US EPA SW-846 quantitative and detection limits for the various required analytes.

7.28 SWMU Aggregate X, Phase I

Aggregate X consists of SWMU No. 48-002(e), SWMU Nos. 48-007(a and d), and SWMU No. 48-010 at TA-48, which is located northwest of TA-55. The SWMUs in Aggregate X include a container storage area and outfalls with an associated surface pond located southeast of the Radiochemistry Laboratory (TA-48-1). The history and use of TA-48 are described in Section 3.5.

SWMU No. 48-002(e) is a small container storage area located on the east side of TA-48-1. The area was listed on the 1988 Laboratory Active Container Storage Database and was used for many years to store solvents such as cutting oil. All containers and other materials were removed from this area in 1989 or 1990 (Roberson 1991, 884). Releases or spills have not been documented at this area (LANL 1990, 7511); however, rust stains were observed on the pavement on which drums were formerly stored. As of June 1992, the area has been used to store a liquid nitrogen tank and several compressed gas cylinders.

Nearly all of SWMU No. 48-002(e) is covered with asphalt. Runoff from the asphalt in this area flows toward an area where samples were collected during a reconnaissance survey for a proposed parking lot approximately 125 ft east, down the hydraulic gradient from the asphalt-covered area. Seven surface samples and five subsurface samples were collected from the area in 1990. No organic, inorganic, or radiological constituents were discovered at significant levels.

The western and northwestern half of the proposed parking lot exceeded *de minimus* alpha levels for soil surface activity, probably caused by stack emissions from the facility. VOCs were not detected in the samples, and most samples were free of SVOCs. Di-n-butly-phtahalate was detected in two samples at 1 ppm, far below EPA action guidelines of 8000 ppm. PCB was detected at <0.61 ppm, and the levels of all toxicity characteristic leaching procedure metals were far below EPA regulatory guidelines (Fresquez 1991, 819).

SWMU Nos. 48-007(a and d) are active outfalls included under NPDES Permit No. NM002835. SWMU No. 48-007(d) was listed as unpermitted in the SWMU Report but was submitted to the EPA in May 1990 for inclusion under the NPDES permit. The effluent, which is industrial noncontact cooling water, drains into a sunlight channel that is located east of TA-48-1. A wetlands area has developed along this channel. The sunlight channel drains into an unlined surface impoundment area (SWMU No. 48-010) 500 ft east of TA-48-1. A large wetlands area has developed around the impoundment area. The extent of potential contamination has not been characterized.

7.28.1 Sampling Plan Rationale and Objectives

The objectives of this Phase I sampling plan are to determine the presence or absence of soil contamination at the small exposed area within SWMU No. 48-002(e) and to determine if water and/or soil contamination is present at the surface impoundment and wetlands area (SWMU No. 48-010). Sample locations selected are biased toward areas where residual contamination is most likely to be present on the basis of the following conceptual model.

- If spills have occurred at SWMU No. 48-002(e), most have been isolated from the environment by the large expanse of asphalt at the site. A small area of ground is exposed, and leaks from barrels containing COCs may have contaminated the area.

- Since 1978 SWMU No. 48-010 has been receiving cool-down water that contains water-treatment chemicals of unknown composition.
- Evaporation from the pond is concentrating these chemicals.

The Phase I investigation is designed primarily to determine the following.

- Does soil or water contamination currently exist in Aggregate X?
- What is the potential for migration of contaminants?

If contaminants are detected in these areas, a Phase II investigation will be conducted to determine the nature and extent of contamination at each site.

Decision logic for Phase I field investigation activities to be conducted at SWMU Aggregate X is presented in Figure 7-64.

7.28.2 Phase I Field Investigation Activities

Engineering and radiological surveys of these SWMUs will be conducted to locate outfalls and sampling points. If radiological anomalies are detected, a surface sample will be collected at that site.

A judgmental approach will be used to select the sampling sites in Aggregate X. A 3-ft auger hole will be sampled at 1-ft intervals beneath the surface of exposed ground in SWMU No. 48-002(e). Because the contents of barrels stored at this site are unknown, these samples will be analyzed for metals; VOCs; SVOCs; PCBs; and gross-alpha,-beta, and -gamma. The samples will also be analyzed using gamma spectroscopy and alpha spectrometry.

One surface sample and one water sample will be collected along the edge of the pond near the outfall from SWMU Nos. 48-007(a and d). One surface sample and one water sample will be collected from SWMU No. 48-010. A third surface sample will be collected above the high-water line in the area of the pond. Approximate locations for these samples are shown in Figure 7-65. Surface samples will be analyzed for metals (including mercury, lead, and chromium) and gross-alpha, -beta, and -gamma. The surface samples will also be analyzed using gamma spectroscopy and alpha spectrometry. The water samples will be analyzed for pH; specific conductance; metals; and gross-alpha, -beta, and -gamma.

7.28.3 Sample Screening And Analysis

Each soil or surface sample will be screened for contact radiation using a scintillation detector. All sample packages will be screened for surface contamination and radiation. The soil samples from SWMU No. 48-002(e) will be analyzed for metals; VOCs; SVOCs; PCBs; and gross-alpha, -beta, and -gamma. The surface samples from SWMU No. 48-010 will be analyzed for metals and gross-alpha, -beta, and -gamma. All soil and surface samples will also be analyzed using gamma spectroscopy and alpha spectrometry. The water samples will be analyzed for pH; specific conductance; metals; and gross-alpha, -beta, and -gamma. Samples to be collected and the analyses required for the Phase I investigation of Aggregate X are summarized in Table 7-31.

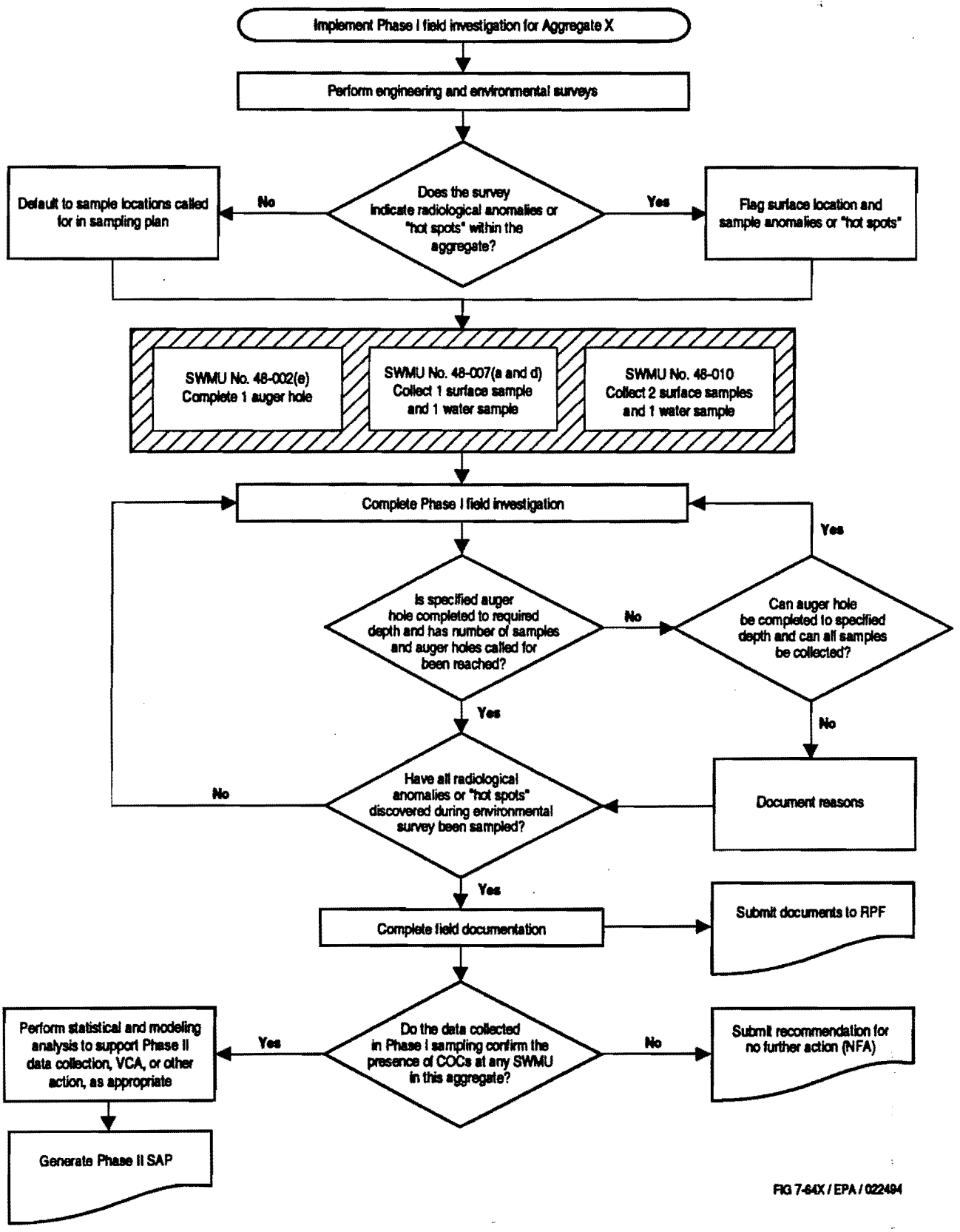
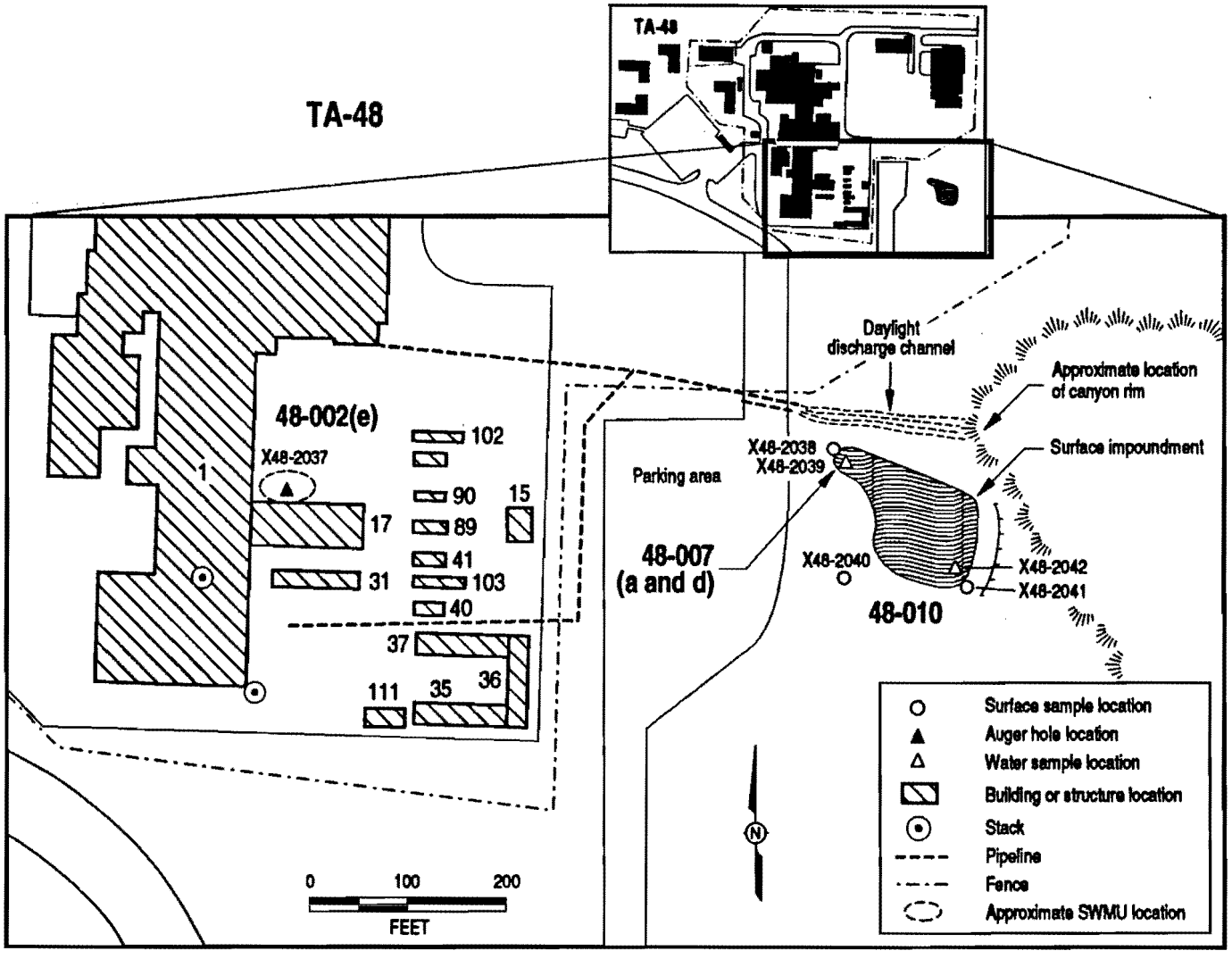


Figure 7-64. Decision logic for the sampling and analysis of SWMU Aggregate X.



7-65[69] / EPA / 032194

ENG-R5125 (LANL 1988, 21559)

Figure 7-65. Schematic sample location map for SWMU Nos. 48-002(e), 48-007(a and d), and 48-010, Aggregate X.

TABLE 7-31

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE X

SWMU	SAMPLE NUMBER	DEPTH	Analyses Required *								
			Gross-alpha,-beta,-gamma	Gamma Spectroscopy	Alpha Spectrometry	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	pH	Specific Conductance
48-002(e)	X48-2037-A1	0–12 in.	1	1	1	1	1	1	1	0	0
	X48-2037-A2	12–24 in.	1	1	1	1	1	1	1	0	0
	X48-2037-A3	24–36 in.	1	1	1	1	1	1	1	0	0
48-007(a and d)	X48-2038-S1	Surface	1	1	1	1	0	0	0	0	0
	X48-2039-W1	Water	1	0	0	1	0	0	0	1	1
48-010	X48-2040-S1	Surface	1	1	1	1	0	0	0	0	0
	X48-2041-S1	Surface	1	1	1	1	0	0	0	0	0
	X48-2042-W1	Water	1	0	0	1	0	0	0	1	1
Rinsate Blanks			1	1	1	1	1	1	1	0	0
Bottle Blanks			0	0	0	1	1	1	1	0	0
Trip Blanks			0	0	0	0	1	0	0	0	0
Duplicates			1	1	1	1	1	1	1	0	0
TOTALS			10	8	8	11	7	6	6	2	2

* Section 5.0 of "Generic Quality Assurance Project Plan for RCRA Facility Investigations for the Los Alamos National Laboratory Environmental Restoration Program" (LANL 1991, 31294) includes US EPA SW-846 quantitative and detection limits for the various required analytes.

7.29 SWMU Aggregate Y, Phase I

Aggregate Y consists of SWMU Nos. 48-007(b, c, and f) at TA-48. These SWMUs are outfalls located north of the Radiochemistry Building (TA-48-1). The SWMUs discharge into Mortandad Canyon along the south rim. TA-48 lies on the north side of Pajarito road and northwest of TA-55. The history and use of TA-48 are described in Section 3.5.

SWMU Nos. 48-007(b and c) are outfalls discharging noncontact cooling water that cools vacuum pumps housed in TA-48-1. The SWMU No. 48-007(b) outfall, discharging up to 420 gal./h, was "grandfathered" in under the NPDES permit (LANL 1985, 853). The SWMU No. 48-007(c) outfall discharges up to 110 gal./h and was submitted for inclusion under the NPDES permit in 1987 (LANL 1991, 21556).

SWMU No. 48-007(f) was submitted to the EPA in November 1987 for inclusion under the NPDES permit to discharge up to 100 gal./day of noncontact cooling water from x-ray equipment in an office and laboratory building (TA-48-46).

7.29.1 Sampling Plan Rationale and Objectives

The objective of this Phase I sampling plan is to determine the presence or absence of soil contamination in these outfalls. Sampling activities are biased toward areas where residual contamination is most likely to be present on the basis of the following conceptual model.

- In the past, unknown chemicals may have been disposed of in these drains.
- The channels for these outfalls may concentrate radioactive particles from materials washed by surface runoff from the facility.
- Contaminants present in the outfalls may concentrate in the drainages where evaporation is occurring.

This Phase I investigation is designed primarily to determine if surface contamination currently exists in Aggregate Y. If contaminants are detected in these areas, the potential for surface migration will be considered, and a Phase II investigation will be conducted to determine the nature and extent of contamination at each site.

Decision logic for Phase I field investigation activities to be conducted at SWMU Aggregate Y is presented in Figure 7-66.

7.29.2 Phase I Field Investigation Activities

A preliminary engineering survey of the SWMUs will be conducted to locate the sampling points, and a radiological survey of the drainages will be conducted to determine if "hot spots" are present. If "hot spots" are detected, they will be sampled. Otherwise, samples will be collected from three points along the outfall drainage where material suspended in the waste stream may have settled or material may have concentrated through evaporation (Figure 7-67). One hand-augered sample will be collected from each outfall drainage wherever possible, and one surface sample will be collected. The auger holes will be 3 ft deep wherever possible, and

samples will be collected at 1-ft intervals beneath the surface. All samples will be analyzed for metals and gross-alpha, -beta, and -gamma. The soil samples will also be analyzed using alpha spectroscopy and gamma spectrometry. Because these outfalls have not been sampled previously, some soil samples, which will be at varying depths in the auger holes, will be analyzed for VOCs, SVOCs, and PCBs to ensure that they are not present in the waste stream. A water sample will be collected at each outfall and analyzed for pH; specific conductance; metals; and gross-alpha, -beta, and -gamma.

7.29.3 Sample Screening And Analysis

Each soil sample will be screened for contact radiation using a scintillation detector. All sample packages will be screened for surface contamination and radiation. All samples will be analyzed for metals and gross-alpha, -beta, and -gamma. The soil samples will also be analyzed using alpha spectroscopy and gamma spectrometry. In addition, a selected interval from each auger hole will be analyzed for VOCs, SVOCs, and PCBs. Where water is present, it will be sampled for pH; specific conductance; metals; and gross-alpha, -beta, and -gamma. Samples to be collected and the analyses required for the Phase I investigation of Aggregate Y are summarized in Table 7-32.

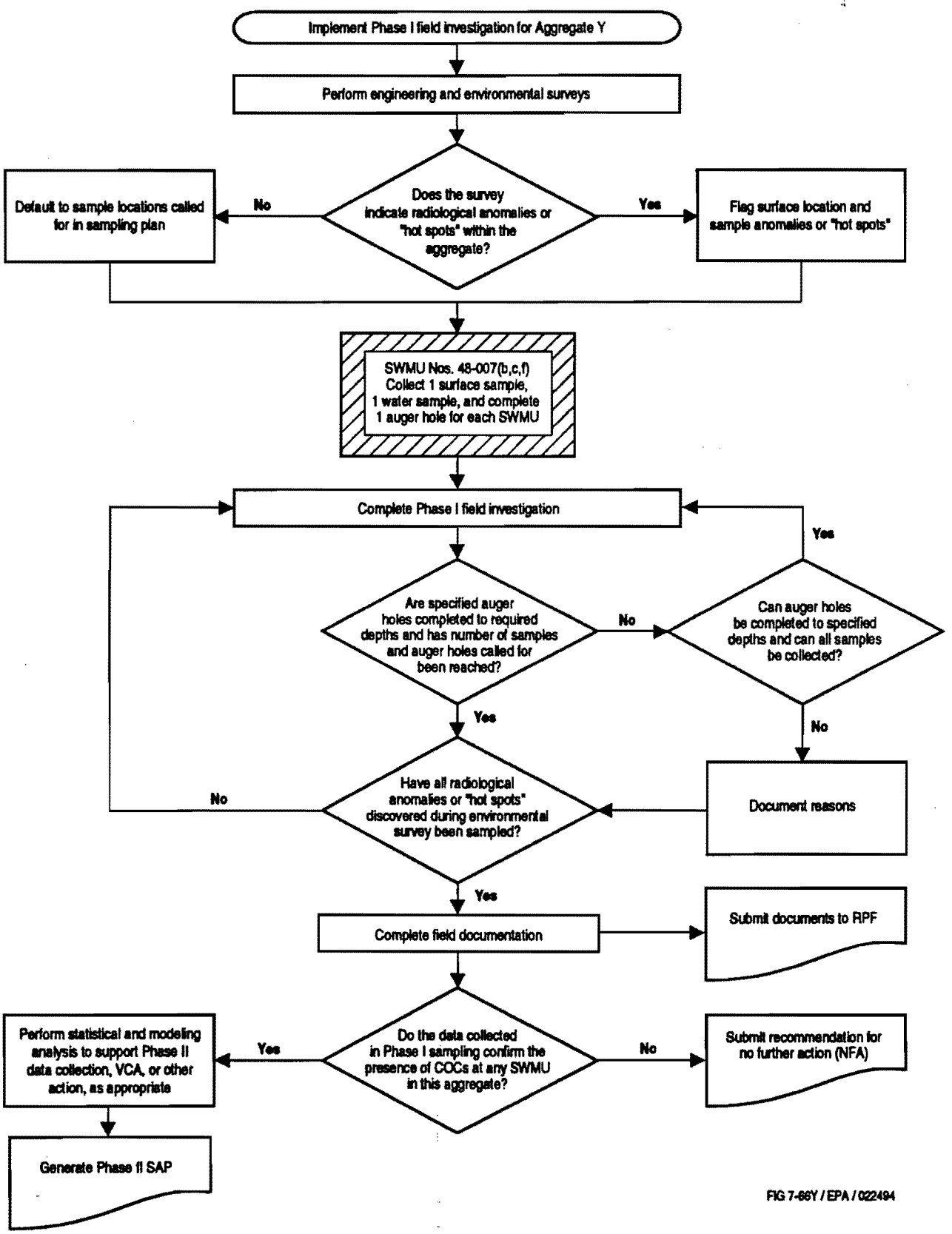
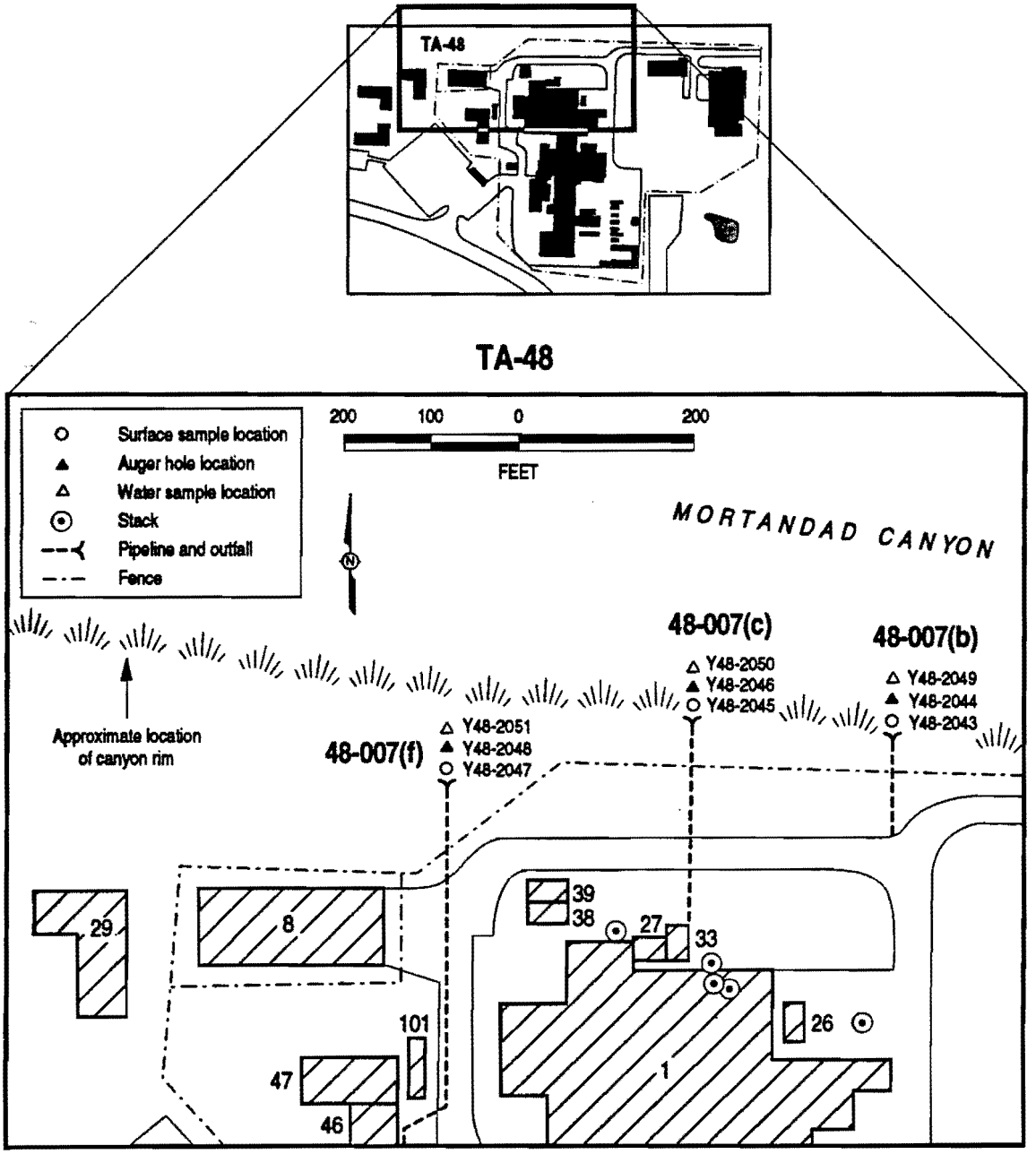


Figure 7-66. Decision logic for the sampling and analysis of SWMU Aggregate Y.



7-67(71)Y / EPA / 032394 ENG-R5125 (LANL 1988, 21559)

Figure 7-67. Schematic sample location map for SWMU Nos. 48-007(b, c, and f), Aggregate Y.

TABLE 7-32

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE Y

SWMU	SAMPLE NUMBER	DEPTH	Analyses Required *								
			Gross-alpha,-beta,-gamma	Gamma Spectroscopy	Alpha Spectrometry	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	pH	Specific Conductance
48-007(b)	Y48-2043-S1	Surface	1	1	1	1	0	0	0	0	0
	Y48-2044-A1	0–12 in.	1	1	1	1	0	0	0	0	0
	Y48-2044-A2	12–24 in.	1	1	1	1	1	1	1	0	0
	Y48-2044-A3	24–36 in.	1	1	1	1	0	0	0	0	0
	Y48-2049-W1	Water	1	0	0	1	0	0	0	1	1
48-007(c)	Y48-2045-S1	Surface	1	1	1	1	0	0	0	0	0
	Y48-2046-A1	0–12 in.	1	1	1	1	0	0	0	0	0
	Y48-2046-A2	12–24 in.	1	1	1	1	1	1	1	0	0
	Y48-2046-A3	24–36 in.	1	1	1	1	0	0	0	0	0
	Y48-2050-W1	Water	1	0	0	1	0	0	0	1	1
48-007(i)	Y48-2047-S1	Surface	1	1	1	1	0	0	0	0	0
	Y48-2048-A1	0–12 in.	1	1	1	1	0	0	0	0	0
	Y48-2048-A2	12–24 in.	1	1	1	1	0	0	0	0	0
	Y48-2048-A3	24–36 in.	1	1	1	1	1	1	1	0	0
	Y48-2051-W1	Water	1	0	0	1	0	0	0	1	1
Rinsate Blanks			1	1	1	1	1	1	1	0	0
Bottle Blanks			0	0	0	1	1	1	1	0	0
Trip Blanks			0	0	0	0	1	0	0	0	0
Duplicates			1	1	1	1	1	1	1	1	1
TOTALS			17	14	14	18	7	6	6	4	4

* Section 5.0 of "Generic Quality Assurance Project Plan for RCRA Facility Investigations for the Los Alamos National Laboratory Environmental Restoration Program" (LANL 1991, 31294) includes US EPA SW-846 quantitative and detection limits for the various required analytes.

7.30 SWMU Aggregate Z, Phase I

Aggregate Z consists of SWMU Nos. 55-011(a through e). The SWMUs are located at TA-55, which is located on Pecos Drive north of Pajarito Drive. TA-55 is located on Mesita del Buey, an extension of the Pajarito Mesa. The mesa is bounded on the north by a branch of Mortandad Canyon and on the south Two Mile Canyon. A summary of TA-55 site history and use is presented in Section 3.7.

SWMU Nos. 55-011(a through e) are outfalls at TA-55 (Figure 3-11, Table 3-44). The storm drains control surface runoff from the vicinity of the Plutonium Building (TA-55-4) and may contain low levels of transuranic radionuclides, solvents, or metals that may have settled on the facilities or parking area from air emissions and other activities. SWMU Nos. 55-011(a, b, c, and e) discharge into Mortandad Canyon; SWMU No. 55-011(d) discharges into Two Mile Canyon. Contaminants washed into the drains may be concentrated in the catch basins or at the outfall discharge points (LANL 1990, 7511).

7.30.1 Sampling Plan Rationale and Objectives

The objective of this Phase I sampling plan is to determine the presence or absence of soil contamination in the outfalls at TA-55.

Sampling activities at the outfalls are biased toward areas where residual contamination is most likely to be present on the basis of the following conceptual model.

- The storm drains are discharging rain and snowmelt from the facility, and contaminants in the effluent are derived from the exposed surfaces of buildings, structures, and the ground.
- Contaminants washed into drains may have concentrated in the soils at the outfall discharge points.

The Phase I investigation of the outfalls is designed primarily to determine the following.

- Does surface contamination currently exist in the catch basins and drains of Aggregate Z?
- What is the potential for surface migration of contaminants?

If contaminants are detected in these areas, the potential for surface migration will be considered, and a Phase II investigation will be conducted to determine the nature and extent of contamination at each site.

Decision logic for Phase I field investigation activities to be conducted at SWMU Aggregate Z is presented in Figure 7-68.

7.30.2 Phase I Field Investigation Activities

A preliminary engineering survey of the SWMUs will be conducted to locate the outfalls and sampling points. A radiological survey will then be conducted in the outfalls and discharge channels.

SWMU Nos. 55-011(a through e) will be sampled at the surface using a stainless steel trowel. (The discharge area of SWMU Nos. 55-011[b and e] coincide with each other; therefore, only one surface sample will be collected to investigate both outfalls.) The sample points will be selected either from a location in the drainage where an anomaly is detected during the radiological survey or from a location in the drainage where settlement is likely to occur. The sampling points are shown in Figure 7-69. The samples will be analyzed for metals; SVOCs; and gross-alpha, -beta, and -gamma. The samples will also be analyzed using gamma spectroscopy and alpha spectrometry. If water is found at any of the sampling sites, samples will be collected and analyzed for pH and specific conductance.

A second location at SWMU Nos. 55-011(a through e) will be sampled by hand augering. The discharge area of SWMU Nos. 55-011(b and e) coincide with each other; therefore, only one auger hole will be drilled to investigate both outfalls (see Figure 7-69). The auger holes will be 3 ft deep, and samples will be collected at 1-ft intervals beneath the surface. The samples will be analyzed for metals; VOCs; SVOCs; and gross-alpha, -beta, and -gamma. The samples will also be analyzed using gamma spectroscopy and alpha spectrometry. The presence of residual VOCs at the site is questionable because of volitalization; however, samples will be analyzed to ensure that VOCs are not present.

7.30.3 Sample Screening and Analysis

Each soil sample will be screened for contact radiation using a scintillation detector. All sample packages will be screened for surface contamination and radiation. The surface samples will be analyzed for metals; SVOCs; and gross-alpha, -beta, and -gamma. The surface samples will also be analyzed using gamma spectroscopy and alpha spectrometry. Subsurface samples will be analyzed for metals; VOCs; SVOCs; and gross-alpha, -beta, and -gamma. The subsurface samples will also be analyzed using gamma spectroscopy and alpha spectrometry. The samples to be collected and the analyses required for the Phase I investigation of Aggregate Z are summarized in Table 7-33.

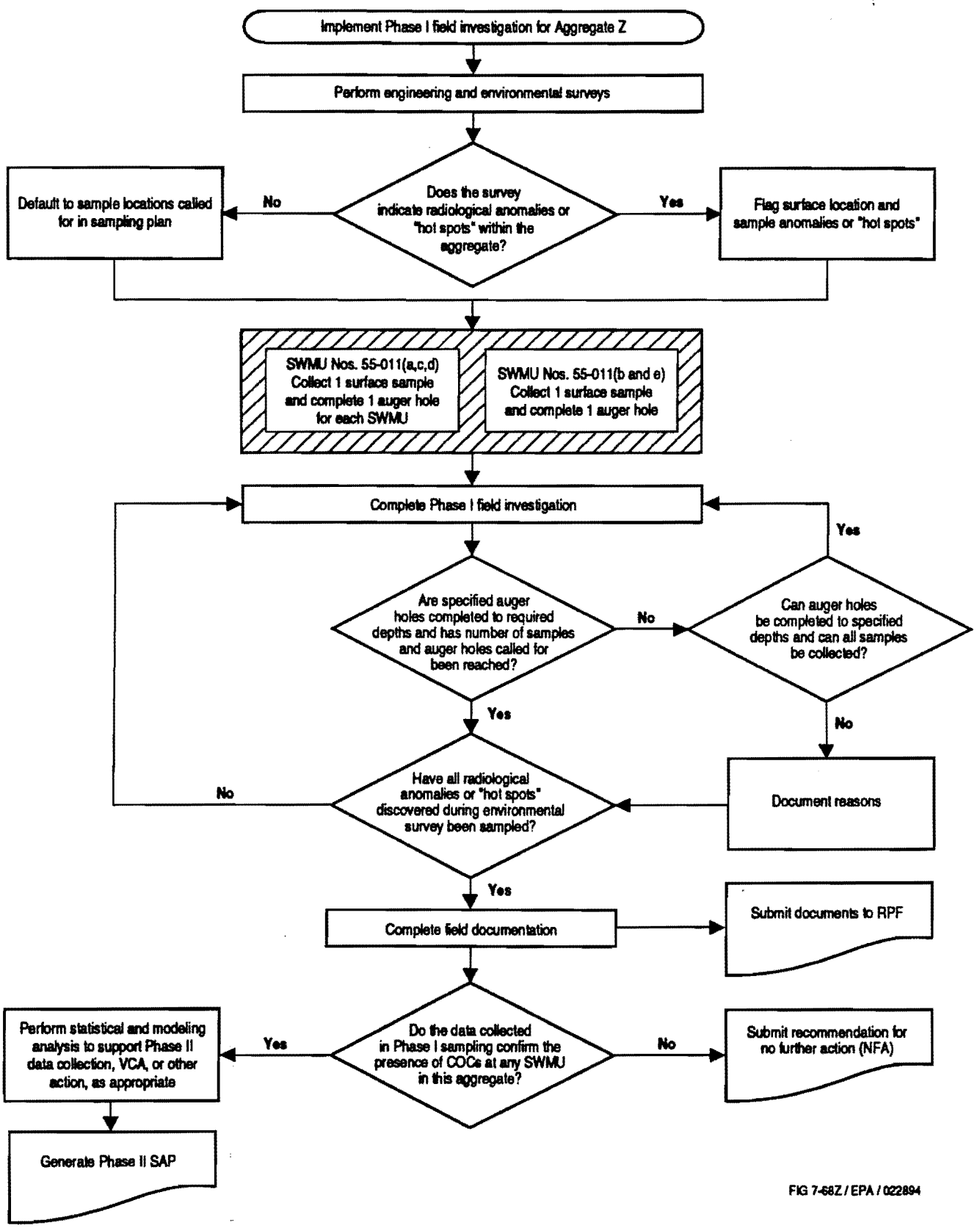


Figure 7-68. Decision logic for the sampling and analysis of SWMU Aggregate Z.

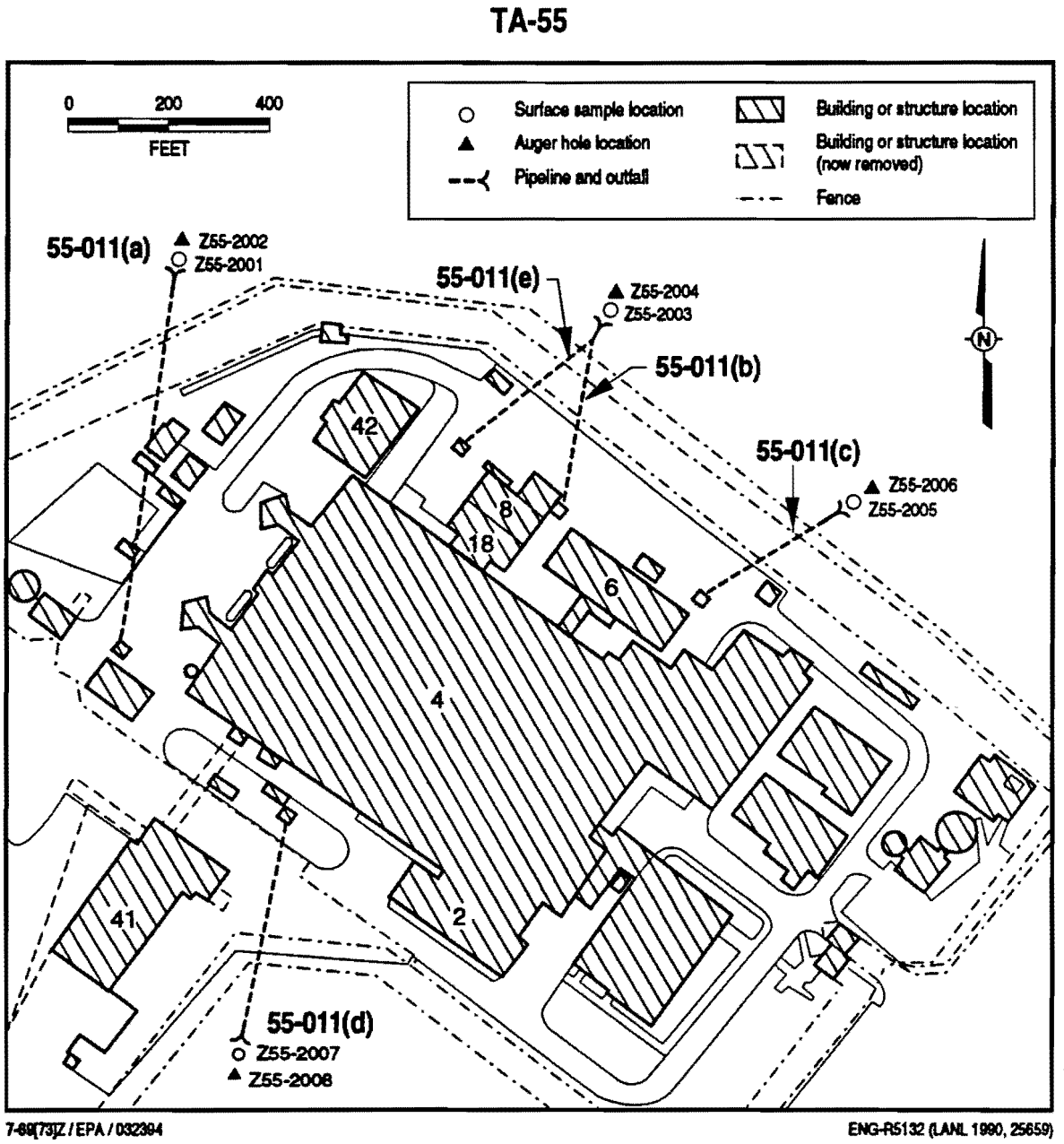


Figure 7-69. Schematic sample location map for SWMU Nos. 55-011(a through e), Aggregate Z.

TABLE 7-33

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE Z

SWMU	SAMPLE NUMBER	DEPTH	Analyses Required *					
			Gross-alpha,-beta,-gamma	Gamma Spectroscopy	Alpha Spectrometry	Metals by XRF or ICPES	VOCs	SVOCs
55-011(a)	Z55-2001-S1	Surface	1	1	1	1	0	1
	Z55-2002-A1	0–12 in.	1	1	1	1	1	1
	Z55-2002-A2	12–24 in.	1	1	1	1	1	1
	Z55-2002-A3	24–36 in.	1	1	1	1	1	1
55-011(b and e)	Z55-2003-S1	Surface	1	1	1	1	0	1
	Z55-2004-A1	0–12 in.	1	1	1	1	1	1
	Z55-2004-A2	12–24 in.	1	1	1	1	1	1
	Z55-2004-A3	24–36 in.	1	1	1	1	1	1
55-011(c)	Z55-2005-S1	Surface	1	1	1	1	0	1
	Z55-2006-A1	0–12 in.	1	1	1	1	1	1
	Z55-2006-A2	12–24 in.	1	1	1	1	1	1
	Z55-2006-A3	24–36 in.	1	1	1	1	1	1
55-011(d)	Z55-2007-S1	Surface	1	1	1	1	0	1
	Z55-2008-A1	0–12 in.	1	1	1	1	1	1
	Z55-2008-A2	12–24 in.	1	1	1	1	1	1
	Z55-2008-A3	24–36 in.	1	1	1	1	1	1
Rinsate Blanks			1	1	1	1	1	1
Bottle Blanks			0	0	0	1	1	1
Trip Blanks			0	0	0	0	1	0
Duplicates			1	1	1	1	1	1
TOTALS			18	18	18	19	16	19

* Section 5.0 of "Generic Quality Assurance Project Plan for RCRA Facility Investigations for the Los Alamos National Laboratory Environmental Restoration Program" (LANL 1991, 31294) includes US EPA SW-846 quantitative and detection limits for the various required analytes.

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