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memorandum

Earth & Environmental Sciences Division
EES-13 • Nuclear Waste Management R&D

To/MS: Barbara Driscoll, EPA Region 6
Thru:/MS Bob Vocke, EM-13, M992
From/MS: Allyn Pratt, EES-13, J521
Phone/FAX: 7-4308/7-1934
Symbol: EES-13-ER-09-93-004
Date: September 30, 1993

LANL/ER/OU 1129

Final Comment Response to the OU 1129 RFI Work Plan NOD

Pursuant to our phone conversation on September 9, 1993, this package contains the revised and final comment response to the referenced NOD. During this conversation you requested that a statement concerning no physical evidence of contamination be added to the response to Specific Comment 3d after OU 1129 personnel conducted a facility inspection. This inspection was conducted and the appropriate words were added to the response to this comment.

Included in this transmittal are:

- revised NOD comment responses per your request;
- all text pages of the Work Plan revised to reflect changes resulting from the NOD response; and
- all graphics and tables from the work plan revised to reflect changes resulting from the NOD response.

On the bases of our meeting last month and our phone conversation, I understand that this package represents everything you need to approve the OU 1129 RFI Work Plan. Please let me know if you have any problems or questions regarding this transmittal. I can be reached at (505) 667-4308.

Enclosures:a/s

Cy:
Rick Hutton, SAIC, J521
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EPA Notice of Deficiencies and OU 1129 Corresponding Responses for RCRA Facility Investigation (RFI) Work Plan for OU 1129

NOTE: Comments responses in **bold face** *are revisions to EPA NOD responses distributed on August 20, 1993. Also, responses now indicate revised page(s) of the RFI Work Plan for OU 1129 (attached) that were changed to address EPA NOD comments.*

GENERAL COMMENTS:

OK **1. Los Alamos National Laboratory (LANL) shall provide information on which miscellaneous analytes will be analyzed and which methods will be used for the analyses.**

All of the sampling and analysis plans (SAPs) that require analysis for miscellaneous analytes will be revised to state the specific analysis to be conducted. The **quantitative and detection limits and analytical** methods listed in **Chapters 5.0 and 9.0, respectively, of** the ***LANL Generic Quality Assurance Project Plan for RCRA Facility Investigations*, LANL-ER-QAPjP, May 1991**, will be used and mentioned in the appropriate SAPs and corresponding tables. The revised SAPs will be forwarded to EPA on September 30, 1993 with other *RFI Work Plan for OU 1129* pages affected by EPA NODs.

RFI Work Plan pages revised to address this comment are as follows: 7-32, 7-36, 7-47, 7-48, 7-53, 7-60, 7-71, 7-76, 7-81, 7-91, 7-96, 7-102, 7-107, 7-115, and 7-121.

OK **2. All the solid waste management units (SWMUs) discussed in Chapter 3 should be addressed either by sampling plans in Chapter 7 or by the no further action (NFA) recommendations in Chapter 6. LANL needs to submit the sampling information for the SWMUs as soon as possible.**

For Example, what about SWMUs 55-004, 005, and 011.

All SWMUs discussed in Chapter 3, except SWMU No. 35-017, are either recommended for NFA in Table 6-1 (as amended) or appear in a SAP in Chapter 7 (as amended). An addendum to the original *RFI Work Plan for OU 1129* was sent to DOE/LAAO on or about March 24, 1993 for review and approval. This addendum will add 71 SWMUs and 9 COCs to Chapters 6 and 7 of the Work Plan. This addendum covers all other SWMUs not in the original *RFI Work Plan for OU 1129*.

SWMU No. 35-017 (a non-HSWA SWMU) was specifically not included in the original *RFI Work Plan for OU 1129* pending the removal of the LAPRE II reactor and receipt of the final decontamination and decommissioning (D&D) report. OU 1129 has now received *Final Project Report TA-35 Los Alamos Power Reactor Experiment No. II (LAPRE II) Decommissioning Project*, LA-12464, February 1993. On the basis of the results in the D&D report, SWMU No. 35-017 is recommended for NFA and will be added to Table 6-1.

Page 6-13 of the RFI Work Plan was revised to address this comment.

OK **3. Chapter 6, SWMUs Recommended for No Further Action:**

a. **SWMU No. 5-003, Calibration Chamber. LANL shall test the bricks for TCLP. EPA recommends that LANL remove the bricks and recycle them using their lead decontamination trailer, if necessary.**

At SWMU No. 5-003, the calibration chamber, the environmental conditions necessary to solubilize and mobilize lead at the site are not present, so they pose no immediate concern to human health or the environment. The purpose of the lead bricks was to shield instruments being calibrated from background levels of radiation. Historical records indicate that no other source term of RCRA concern was ever present in the chamber. OU 1129 does not think that it is necessary to test the bricks for TCLP because all evidence indicates they are made of lead and doing a leaching procedure on the bricks will not provide new information. **OU 1129 will request that LANL pursue a voluntary corrective action (VCA) to remove the lead bricks and will not pursue a permit modification to delist SWMU No. 5-003 until a decision to pursue VCA is reached.**

b. **SWMU No. 35-002. Additional information needs to be submitted concerning this SWMU. What were the hazardous constituents of concern? Who at EPA concurred on the D&D effort and soil sampling plan? Was a plan submitted to EPA for approval? When will the results of the completed project be submitted to EPA?**

Additional information concerning this SWMU can be found in the SAP, *Plan for Environmental Sampling–Removal of Los Alamos Power Reactor Experiment No. 2 (LAPRE II) Reactor Vessel and Fuel Reservoir*, March 28, 1991. This SAP was produced for the D&D of LAPRE II. Following this D&D effort, LANL published *Final Project Report TA-35 Los Alamos Power Reactor Experiment No. II (LAPRE II) Decommissioning Project,* LA-12464, February 1993. On the basis of the D&D report, LA-12464, Section 2.2, the lead in the bricks is the only RCRA COC. The bricks were removed and stored under EPA and state regulations. OU 1129 has researched EPA's involvement in the SAP and D&D effort and has not confirmed its concurrence; therefore, the third sentence, "The decontamination and decommissioning..." will be deleted from the description/justification block for SWMU No. 35-002 in Table 6-1. Information in the RFI *Work Plan for OU 1129*, Chapter 3 concerning this SWMU will be updated to reflect the information in LA-12464.

Pages 3-70 and 6-8 of the RFI Work Plan were revised to address this comment.

c. **SWMU No. 42-004, Canyon Disposal. Sampling locations and information should be submitted to EPA for review prior to a decision being made on this unit.**

In 1978, TA-42, the Incinerator Site, underwent D&D activities. The final report, *The Decommissioning of the TA-42 Plutonium Contaminated Incinerator Facility*, LA-9077-MS, was released in November 1981. In 1991, LANL's Environmental Protection Group (EM-8) conducted a reconnaissance sampling survey. In July 1992 after DOE/LAAO verbally notified EPA, OU 1129 conducted a VCA to facilitate construction validation of the Nuclear Safeguards Technology Laboratory. The *Revised Sampling and Analysis Plan for OU 1129 Aggregate J*, LA-UR-92-2120, was written in July 1992. The sampling data has been reported in the OU 1129 "Quarterly Report for January through March 1993," EES-13-ER-04-93-040, and "Corrected Tables for Quarterly Report for January through March 1993," EES-13-ER-05-93-055. OU 1129 will report the TA-42 data in the phase report for this area. On the basis of the D&D effort, the reconnaissance survey, and the OU 1129 sampling, this site is a candidate for being recommended for NFA at the present time.

Page 6-14 of the RFI Work Plan was revised to address this comment.

✓ d. **SWMU Nos. 48-004(a through c), Sumps and Tanks. Any decision related to these units will be deferred until D&D has been completed. When is D&D scheduled to occur for this building? LANL has not determined whether a release has occurred from these units.**

Building TA-48-1 is the primary structure for the Isotope and Nuclear Chemistry Division and LANL has no current plans for near-term D&D. SWMU Nos. 48-004(a through c) are considered to be under operational control. There is no longer a source term and no mechanism for release to the environment. Archival information documents no spills or releases within the building. T**he tanks and sumps of SWMU Nos. 48-004(a through c) have been inspected, and there is no physical evidence of releases or external contamination.** A SWMU can be considered for NFA if site design, conditions, or operational controls preclude any release from the SWMU that would pose a threat to human health or the environment. SWMU Nos. 48-004(a through c) are recommended for NFA. Table 6-1 will be revised to clarify this information.

Page 6-14 of the RFI Work Plan was revised to address this comment.

✓ e. **SWMU No. 52-003(b), Industrial Waste Lines. More information needs to be submitted, including sampling data and depth of sampling prior to a decision on this unit.**

LANL published *Decommissioning of the UHTREX Reactor Facility*, LA-12356, August 1992, after the UHTREX Reactor and associated industrial waste lines were completely decommissioned in September 1990. The report includes sampling depths and data in Section 5.0, Post-Decommissioning Radiological Survey Procedures and Results. Memorandum HSE8-88-603, "Results of Screening Analyses of Soil Material Collected from Industrial Waste Line 66 Connecting TA-52 to TA-50," October 12, 1988; and memorandum HS-3-FSA:91-206, "TA-52 Facilities Decommissioned in UHTREX D&D Project: Remove from SWMU and RPIS Lists," October 30, 1991, discuss D&D activities at this site. Information concerning this SWMU in the *RFI Work Plan for OU 1129* will be updated to reflect the information in LA-12356.

Page 6-17 of the RFI Work Plan was revised to address this comment.

f. **All other SWMUs for which NFA was requested, and that are not currently in the HSWA permit, do not need to be added to the permit. For SWMUs currently in the permit for which an NFA decision is required, LANL must submit a Class III permit modification prior to removal of those SWMUs from the permit.**

LANL will submit a Class III permit modification as necessary; OU 1129 will coordinate the list of approved non-HSWA permit NFA SWMUs with the ER Program office to ensure that they are not added to the permit.

SPECIFIC COMMENTS

1. **SWMU Nos. 52-002(a through g), page 3-114. Text on page 3-115 identifies SWMU No. 52-002(e) as now being SWMU No. 63-001(a) while <u>Table 1-1, Current Listing of Operable Unit 1129 SWMUs and AOCs as of 1990</u> lists SWMU No. 52-002(k) as being SWMU No. 63-001(a and b). Please clarify the SWMU numbers and text.**

According to unit information and maps in the 1988 and 1990 SWMU reports, an active, 1,000-gal. septic tank, TA-52-49, designated as SWMU No. 52-002(f), and the associated seepage pit, TA-52-50, designated as SWMU No. 52-002(g), in the 1988 SWMU Report were combined and became SWMU No. 52-002(e) in the 1990 SWMU Report. SWMU No. 52-002(e) is the same as SWMU No. 63-001(a) because the western portion of TA-52 and associated structures became TA-63 in 1989. The text on pages 3-115 and 3-134 is correct.

According to unit information and maps in the 1988 SWMU Report, an active, 920-gal. septic tank, TA-52-154, and associated seepage pit, TA-0-462, were designated as SWMU No. 52-002(k). According to unit information and maps in the 1990 SWMU Report, septic tank TA-52-154 became part of TA-63 in 1989, and SWMU No. 52-002(k) was redesignated as SWMU No. 63-001(b). The text on pages 3-134 and 3-136 is correct.

Table 1-1 of the *RFI Work Plan for OU 1129* will be changed to reflect this information more clearly.

Page 1-7 of the RFI Work Plan was revised to address this comment.

2. **5.1 Summary of OU 1129 Technical Approach, page 5-2. As part of the technical approach, one of the listed approaches indicates that "SWMUs are recommended for CMS when the analytical sample mean exceeds action levels for individual components." Under the proposed Subpart S Regulations, when concentrations of hazardous constituents in ground water, surface water, soils, or air exceed an action level, and there is reason to believe that such hazardous constituents have been released from a SWMU at the facility, EPA may require a corrective measure study (CMS). The use of a sample mean for determination of a CMS is not acceptable. This comment also applies to Section 5.2.7, Decision Point 4, on page 5-9. In addition, EPA risk assessment guidance calls for calculating the 95 percent upper-confidence limit (UCL) on the arithmetic mean of site contamination rather than the 90 percent confidence interval used by LANL.**

Referenced sections will be changed to reflect that these decisions will be based on the 95 percent UCL for comparison of a contaminant's concentration to its screening action level (SAL). Those SWMUs at which this criterion is met may be recommended for either VCA or a focused CMS. This statement is based on the assumption that the LANL Installation Work Plan, Appendix K (when published), will adopt this strategy for data analysis, and that the EPA Region 6 guidance will in fact be to use the 95 percent UCL (per proposed Subpart S section 264.511[a][7]).

The last bullet, second sentence, under Section 5.1 will be changed to read, "SWMUs are recommended for CMS when the 95 percent upper confidence limit (95% UCL) on the arithmetic mean concentration of an individual site contaminant exceeds the screening action level (SAL) for that contaminant, or when ...."

The first bullet under Section 5.2.7 will be changed to read as follows, "the 95% UCL on the arithmetic mean concentration of an individual site contaminant does not exceed the SAL for that contaminant, and."

Pages 5-2 and 5-9 of the RFI Work Plan were revised to address this comment.

3. **7.5.2 Phase I Field Activities Investigation, SWMU Aggregate A, page 7-17.**

a. **Soil samples should be analyzed for metals as well as radioactive components, as indicated in Section 7.5.3.**

The total list of RCRA metals will be added to the list of analytes.

Page 7-19 of the RFI Work Plan was revised to address this comment.

b. **SWMU No. 4-002, the canyonside disposal area, which is sampled at several intervals, should have at least one borehole through the debris material, as continuous bulldozing of material may have covered contaminated material. High explosive (HE) spot testing should also be conducted if possible.**

The sampling locations indicated in the SAP are examples only and depend entirely on the outcome of initial geophysical surveying. OU 1129 believes that the SAP as written represents a conservative and professionally safe and sound approach to this investigation. Because of the documented presence of large metal debris such as steel girders, rebar, metal containers, and gas cylinders in the detritus of the disposal area, additional reconnaissance information from geophysical methods will be used to choose an appropriate discrete sampling method. The revised SAP will show that spot testing for HE will be conducted where reconnaissance suggests that HE is most likely to be present in the vicinity of the old firing pits.

Page 7-18 of the RFI Work Plan was revised to address this comment.

4. **7.6 SWMU Aggregate B, Phase I, page 7-20.**

a. **Samples should be analyzed for metals as is indicated in Section 7.6.3. Analysis for metal was left out of Section 7.6.2.**

The total list of RCRA metals will be added to the list of analytes.

Page 7-24 of the RFI Work Plan was revised to address this comment.

b. **Additional sampling should be conducted for SWMU No. 5-002, Canyonside Disposal, as this SWMU is subject to additional erosion due to location on the canyonside. LANL shall submit an additional work plan for both SWMU Nos. 4-002 and 5-002.**

Text will be added to the appropriate SAPs to indicate that additional downslope surface geophysical surveying and surface sampling for the specified contaminants will be conducted. Attention will be given to the possible need for engineered slope/erosion control if surveys indicate the need to prevent possible debris migration.

Pages 7-18 and 7-22 of the RFI Work Plan were revised to address this comment.

5. **SWMU No. 5-004, Septic Tank, Subsurface Investigation, page 7-30.**

a. **This borehole should be field screened for volatile organic compounds (VOCs) and samples should be analyzed for VOCs.**

The septic tank was abandoned more than 34 years ago, and the tank and pipe were removed, which aerated the soil, 33 years ago. Therefore, OU 1129 has no reason to believe that any of the VOCs would still be present in this area. Samples from this site will be analyzed for semivolatile organic compounds (SVOCs) because if organics were present in this septic system, there is a possibility that SVOCs could still be present.

OU 1129 will change all SAPs to reflect that for SWMUs with potential VOC source terms older than 10 years, all collected core and auger material will be screened with the appropriate organic vapor analyzer, flame ionization detector, or photoionization detector field instrument for VOCs. If VOCs are indicated, then a discrete sample will be collected and analyzed for VOCs. Other-wise, routine VOC analysis will be conducted for SWMUs with more recent VOC source terms.

RFI Work Plan pages revised to address this comment are as follows: 7-46, 7-64, 7-79, 7-89, 7-101, 7-105, 7-108, and 7-113.

b. **It is unclear from the text the number of samples which will be collected if no radioactivity is encountered. Table 7-2 shows that two samples will be collected, one each at the 5-10 ft depth and the 10-15 ft depth. The tables should be consistent with the text.**

SWMU No. 5-004, Septic Tank, Subsurface Investigation, page 7-30, third paragraph, will be revised to state, **"The one soil boring will be drilled to a minimum depth of 15 ft using a hollow-stem auger with a decontaminated 5-ft split-spoon core barrel. As each 5-ft section of core is retrieved from the borehole, the soil and/or rock will be screened with a radiation monitor and an OVA or a PID. Screening measurements will be recorded on the daily field log. If VOCs are indicated, a discrete sample will be collected and analyzed. A sample will be collected on the basis of radiological monitoring. If radiation levels are at or below background, a random sample will be taken within the 5-ft interval. If radiation levels are above background, a sample will be taken at that location within the 5-ft interval. The exact depth of the samples will be recorded on the daily field log. Drilling will stop when field screening determines that two consecutive core intervals are at or below background measurements for radiation.**

"Collected samples will be screened for radioactivity and submitted to the laboratory for analysis. Each sample will be analyzed for metals by ICPES; SVOCs; gross-alpha, -beta, and -gamma; gamma spectrometry; and alpha spectroscopy."

Page 7-30 of the RFI Work Plan was revised to address this comment.

c. **There is no reason to believe that hazardous constituents are collocated with the radioactive constituents for this liquid discharge area. A sample from each 5-ft section of core should be analyzed for VOCs, SVOCs, and metals.**

A sample from each 5-ft section of core will be analyzed for gross-alpha, -beta, and -gamma; metals by ICPES; SVOCs; and using gamma spectrometry and alpha spectroscopy. These samples will not be analyzed for VOCs; see response for comment 5a for further explanation.

Page 7-30 of the RFI Work Plan was revised to address this comment.

d. **What are the miscellaneous analytes being analyzed, and what are the analytical methods being used?**

Miscellaneous analytes will not be analyzed during the subsurface investigation of SWMU No. 5-004 as shown on Table 7-2, the text on page 7-30 is in error, and OU 1129 will correct it.

Page 7-30 of the RFI Work Plan was revised to address this comment.

6. **SWMU No. 5-004, Septic Tank, Surface Investigation, page 7-30.**

a. **What miscellaneous analytes are being analyzed, and what are the methods used in analysis?**

The miscellaneous analytes that will be analyzed for are HEs: HMX, RDX, NB, 1,3-DNB, 1,3,5-TNB, 2,4-DNT, 2,6-DNT, 2,4,6-TNT, and TETRYL. The method used to analyze all of these HEs will be USATHAMA (U.S. Army Toxic and Hazardous Materials Agency) by High Performance Liquid. OU 1129 will revise the *RFI Work Plan for OU 1129* to clarify miscellaneous analytes.

Page 7-32 of the RFI Work Plan was revised to address this comment.

b. **At what depth will surface samples be collected?**

Surface samples will be taken from the top 0 to 6 in.; OU 1129 will revise the *RFI Work Plan for OU 1129* accordingly.

Page 7-30 of the RFI Work Plan was revised to address this comment.

7. **SWMU No. 5-005(a), French Drain, Subsurface Investigation, page 7-31. At least 10 percent of the samples should be analyzed for VOCs.**

The French drain was abandoned more than 30 years ago and removed in 1985; on the basis of published research on VOC environmental behavior, there is no reason to believe that any of the VOCs would still be present in this area. Samples from this site will be analyzed for SVOCs because if organics were present in this French drain system, they could still be detected.

8. **SWMU No. 5-005(a), Surface Investigation, page 7-31. At what depth will samples be collected?**

Surface samples will be taken from the top 0 to 6 in.; OU 1129 will revise the *RFI Work Plan for OU 1129* accordingly.

Page 7-31 of the RFI Work Plan was revised to address this comment.

9. **SWMU Nos. 35-003(a, b, c, and n), Surface and Subsurface Investigations, page 7-35.**

a. **Boreholes should be located based on best judgment rather than randomly from a grid. If the pit and tanks were removed in 1991, it should have been determined at that time whether there was any leakage. If this removal has not been conducted, then boreholes should be placed next to the pits where the connection with the inflow and outflow lines occurs. Additional boreholes may be required for the pit. Can the pit be inspected for leaks? Did overflows occur?**

Scheduling changes within LANL D&D operations since this *RFI Work Plan for OU 1129* was written have invalidated the assumptions used in creating the SAP for SWMU Nos. 35-003(a,b,c, and n). The phase separator pit and associated lines and tanks have not been removed; they will likely be removed in either FY94 or 95. The LANL D&D Program is now part of the ER Program and will be conducted in cooperation with other ER activities. OU 1129 will now have an opportunity to ensure that any sampling during D&D complements the objectives of the *RFI Work Plan for OU 1129.*

OU 1129 requests that a formal SAP for these SWMUs be delayed and done in concert with D&D planning. Concerns of the reviewer can be addressed at that time. Because this area is fully under institutional control and environmental surveillance data indicate no immediate concerns to human health or the environment, deferring the SAP until D&D planning will allow for a much more cost-effective and thorough SAP to be developed.

LANL will notify EPA as a soon as a SAP is complete for these SWMUs; this SAP will be an addendum to the *RFI Work Plan for OU 1129.* Status will be updated in each quarterly report.

Pages 7-33 and 7-35 of the RFI Work Plan were revised to address this comment.

b. **It is unclear when comparing the text with Table 7-3 which intervals will be sampled. Text indicates samples will definitely be collected within the top two feet and at the bottom five foot interval. Text then indicates samples will be collected at two areas determined by random generation, at the interval with the highest contamination from radioactive field screening, and if no radioactive contamination is found then at the section's midpoint. Sampling locations need to be clarified and match the Table.**

See response for specific comment 9a.

Pages 7-33 and 7-35 of the RFI Work Plan were revised to address this comment.

10. **SWMUs Nos. 35-003(a-q), Wastewater Treatment Plant, page 3-38. What is the construction of the phase separator pit? Was this an open pit, and did it overflow?**

As-built drawings of the phase separator pit provided construction information. The phase separator pit was not an open pit, and there is no documented evidence of the pit ever overflowing. Also, see response for specific comment 9a.

Pages 7-38 and 7-78 of the RFI Work Plan were revised to address this comment.

11. **SWMUs Nos. 35-003(d, l, and q), Surface and Subsurface Investigations, page 7-42. The history of this area and the previous D&D work should be utilized in developing the sampling plan for these SWMUs rather than using a grid and random boreholes. Boreholes should be located preferentially in areas where spills occurred if these are known.**

Operational history and D&D information were exhaustively reviewed in preparing the SAP. Because of the lack of reliable detailed spatial information, the present sampling plan represents the best professional judgment of appropriate sampling strategies.

In the area which underwent D&D, contaminated soil was removed to a depth of around 20 ft. The first borehole sample should be collected around the interval where the backfill meets original soil or tuff. Samples should then be collected on 10- to 15 -ft intervals down to 50 ft, and then at total depth unless field screening (radioactive and VOCs) or visual inspection indicates contamination below 50 ft. Boreholes B-11 and B-12 should remain as located for outfalls from lines 71 and 95.

All historical information was used in developing the SAPs for this area. The previous spills at these SWMUs were recorded, but their exact locations were not documented. The grid and random sample points technique is often used for locating COC plumes of unknown direction but with a documented source. The source of the fill material is not documented. There is also a potential for additional contamination of the surface fill area from up-gradient rain-wash over potentially contaminated soil.

The possibility for transport to depth exists because the area is dominated by vertical to near-vertical fractures, and modeling indicates that COCs could reach the depths described in the SAP. The post-D&D activities around the site, as well as the surface drainage patterns in the area, make it prudent to sample at the surface. Additional sample points in these boreholes will be added to the SAP to cover the interval in which the backfill intersects the tuff. All other sample points will be left as is, which is consistent with the overall Phase I technical approach.

Page 7-44 of the RFI Work Plan was revised to address this comment.

12. **SWMU Nos. 35-003(e, f, g, m, and o), Surface and Subsurface Investigation, page 7-44. Was contamination found when SWMU Nos. 35-003(e, f, g, and o) were removed? More information from the previous D&D (page 3-75) should be provided and this information should be used to create a sampling plan. Boreholes should be located based on best professional judgment where previous spills may have occurred. The area designated as SWMU No. 35-003(m) should be sampled to a depth of 30 ft, or until field screening indicates no contamination, whichever is deeper. Sampling should begin below fill material or at fill/tuff interface.**

Although most of the structures associated with the wastewater treatment plant have been decontaminated and decommissioned, gross-beta activity ranging from 100 pCi/g to 5,000 pCi/g remained at depths of 5 ft and deeper. D&D activities were not focused on removing SWMUs, but on removing facilities; no SWMUs were removed during D&D. The SWMU designations were overlaid on the site subsequent to D&D based on suspected and documented residual contamination. Contamination is present in the local soils, tuffs, and associated fractures. The report *Radioactive Liquid Waste Lines Removal Project at Los Alamos (1981-1986)*, LA-10821-MS, September 1986, describes the removal of waste lines, associated structures, and the remaining contamination. The SWMU No. 35-003(m) investigation will require a borehole to a depth of 30 ft (Table 7-5, B-3). Field screening will be used, but this portion of the investigation is to determine the nature and not the extent of contamination. Sampling boreholes beyond 30 ft is unlikely to provide additional information on the nature of COCs at the site. There is no documentation that clean fill was used at the sites for backfill nor how much fill was brought in during D&D. OU 1129 is planning to sample according to the proposed SAP.

13. **Statement on page 7-45. The statement beneath Table 7-5 is contradictory to the table. The table indicates that all samples will be analyzed for all the COCs while the statement indicates that 10 percent of the samples will be analyzed for COCs. All the samples collected from the boreholes should be analyzed for VOCs, metals, PCBs, and SVOCs. A reduction in analysis may be requested from EPA after initial results are reviewed.**

    The text under Table 7-5 is misplaced and does not belong with the discussion of Aggregate D and Table 7-5. The text correctly belongs in Section 7.10.1 on page 7-58 of the *RFI Work Plan for OU 1129*. OU 1129 does not anticipate a reduction in analysis for the sampling in Aggregate D, Table 7-5. The *RFI Work Plan for OU 1129* revision will put the text in its proper location.

    Pages 7-44, 7-45, and 7-54 of the RFI Work Plan were revised to address this comment.

14. **SWMU No. 35-003(r), Surface and Subsurface Investigation, page 7-46. Text indicates that "To complement the samples taken at the prescribed intervals, samples will be collected from any sections indicating contamination from field screening techniques." Will these additional samples be analyzed for all potential contaminants? Samples which indicate contamination should be analyzed preferentially.**

    Additional samples will be analyzed for all of the same potential contaminants that the samples at prescribed intervals will be analyzed for (Table 7-7).

15. **SWMU Nos. 35-009(a through d). Subsurface Investigations, page 7-60. Text on this page indicates that the initial 10 percent of sample locations from each SWMU will be analyzed for Level III VOCs, SVOCs, metals, and radioactive contamination, and then analysis may be reduced based on results. Table 7-9 and Section 7.10.3 indicate that all samples will be analyzed for Level III VOCs, SVOCs, metals, and radioactive constituents. LANL shall clarify what analysis will be conducted.**

    The phrase "Initial 10% of" will be deleted from the sentence. All samples will be analyzed according to Table 7-9.

    Page 7-64 of the RFI Work Plan was revised to address this comment.

16. **7.12 SWMU Aggregate H, Phase I, page 7-71. Text on page 3-70 indicates that nonradioactive hazardous material may have been emitted from the stack; although this cannot be verified. What are the possible nonradioactive COCs? If this SWMU No. 35-014(a) only has a radioactive component, then it should not be listed as a SWMU.**

    The text on page 3-70 will be revised to reflect that a review of documented stack emissions list no nonradioactive effluents. Although SWMU No. 35-014(a) is a radiological concern only, it is also a listed HSWA SWMU. OU 1129 has chosen to investigate the PCB spills of SWMU No. 35-014(b) along with SWMU No. 35-014(a) for operational efficiency reasons. Analytical requirements listed in Table 7-11 are still valid.

    Page 3-70 of the RFI Work Plan was revised to address this comment.

17. **7.14 SWMU Aggregate J, Phase I, page 7-82. SWMU No. 42-001(a through c), and 42-003 are not listed in the HSWA Module VIII.**

These SWMUs are not on the HSWA list. However, in July 1992 after DOE/LAAO verbally notified EPA, OU 1129 conducted a VCA to facilitate construction validation of the Nuclear Safeguards Technology Laboratory. The revised SAP for TA-42 incorporated a set of reconnaissance sampling data for RCRA contaminants that LANL Group EM-8 collected in 1991. The reconnaissance sampling data were not available when the original *RFI Work Plan for OU 1129* was written. The revised SAP for TA-42 (as implemented in July 1992) will be included in the revised *RFI Work Plan for OU 1129*. The data from the TA-42 investigation last year has been reported in the OU 1129 "Quarterly Report for January through March 1993," EES-13-ER-04-93-040, and "Corrected Tables for Quarterly Report for January through March 1993," EES-13-ER-05-93-055. See response to general comment 3c.

Page 7-82 of the RFI Work Plan was revised to address this comment.

18. **SWMU Nos. 42-001(a) and 42-002 (a). Subsurface Investigation, page 7-87.**

a. **Table 7-13 indicates that analysis will conducted for constituents other than radioactive constituents, while text indicates that sample analysis will be limited to radiological constituents. LANL should clarify what analysis will be conducted. Table 7-13 should be corrected to indicate actual analysis planned for all SWMUs in TA-42.**

See response for specific comment 17.

Page 7-82 of the RFI Work Plan was revised to address this comment.

b. **Was there leakage from the influent line to the septic system? If so, then borehole B-4 should have the same analysis as boreholes B-12 and others, for the septic tank system.**

See response for specific comment 17.

Page 7-82 of the RFI Work Plan was revised to address this comment.

19. **SWMU No. 42-003, Subsurface Investigations, page 7-95. Were metals previously analyzed at this SWMU? Text on page 7-95 indicates that SVOCs were previously encountered, and text on page 3-82 indicates that possible contaminants included solvents, acids, and greases. For these reasons, a percentage (20%) of the samples collected should be analyzed for metals and SVOCs.**

See response for specific comment 17.

Page 7-82 of the RFI Work Plan was revised to address this comment.

20. **7.15 SWMU Aggregate K, Phase I, page 7-99. SWMU No. 48-001 is not listed in the HSWA Module VIII.**

The text will be changed to reflect that SWMU No. 48-001 is not listed in the HSWA Module. Sampling activities for TA-48 SWMUs are currently scheduled for July 1993. Initial data will be reported in the LANL ER Program FY94 January through March Quarterly Report.

Page 7-83 of the RFI Work Plan was revised to address this comment.

21. **7.16.3 Sample Screening and Analysis, page 7-112. LANL might consider using an x-ray Fluorescence for screening metals.**

X-ray fluorescence **(XRF)** will be **considered on a SWMU-by-SWMU basis**. OU 1129 used XRF during the investigations at TA-42 in July 1992 with very good results.

TABLE 1-1

CURRENT LISTING OF OPERABLE UNIT 1129 SWMUs AND AOCs AS OF 1990

NOTE: To cross reference SWMUs from Tables A and B of the HSWA Module, please refer to this table first for current SWMU nomenclature (per 1990 SWMU list). All HSWA Module-listed SWMUs appear in either Table 6-1 (for NFA recommendation) or in Chapter 7.0 (for further investigation). See Table 7-1 for SWMUs addressed in Chapter 7.0.

SWMUs Listed in 1988 SWMU Report[a]	SWMUs Listed in Tables A and B of HSWA Module[b]	Renumbered SWMUs (as of 1990)[c]	Additional SWMUs or Areas of Concern[c] (as of 1990)	Current Listing of SWMUs and Areas of Concern[c] (as of 1990)	SWMU Description
Technical Area 4					
4-001	4-001		—	4-001	Firing Site
4-002	4-002		—	4-002	Surface Disposal Site
—	—		4-003(a-b)	4-003(a-b)	Drains and Outfalls
—	—		4-004	4-004	Soil Contamination Beneath Former Building
—	—		C-4-001	C-4-001	Potential Soil Contamination Associated with Former Structures
Technical Area 5					
5-001(a-b)	5-001(a-b)		—	5-001(a-b)	Firing Sites
-	-		5-001(c)	5-001(c)	Firing Site
5-002	5-002		—	5-002	Canyonside Disposal
5-003	5-003		—	5-003	Calibration Chamber
5-004	5-004		—	5-004	Septic System
5-005	5-005*	5-005(a)	—	5-005(a)	French Drain
—	—		5-005(b)	5-005(b)	Outfall
—	—		5-006(a-h)	5-006(a-h)	Soil Contamination Beneath Former Buildings
—	—		C-5-001	C-5-001	Potential Soil Contamination Associated with Former Structures

TABLE 1-1 (continued)

CURRENT LISTING OF OPERABLE UNIT 1129 SWMUs AND AOCs AS OF 1990

SWMUs Listed in 1988 SWMU Report[a]	SWMUs Listed in Tables A and B of HSWA Module[b]	Renumbered SWMUs (as of 1990)[c]	Additional SWMUs or Areas of Concern[c] (as of 1990)	Current Listing of SWMUs and Areas of Concern[c] (as of 1990)	SWMU Description
Technical Area 35					
35-001	—		—	35-001	Material Disposal Area W
35-002	35-002		—	35-002	Material Disposal Area X
35-003(a-q)	35-003(a-q)*	—	35-003(r, misc.)	35-003(a-r, misc.)	Wastewater Treatment Plant and Receiving Canyon
35-004(a-j)	35-004(e)		35-004(k-o)	35-004(a-o)	Active/Inactive Container Storage Areas
35-005	—	—	—	35-005(a-b)	Inactive Surface Impoundments
35-006	35-006*	—	—	35-006	Decommissioned Surface Impoundments
35-007	—	—	—	35-007	Waste-Oil Treatment
35-008	35-008	—	—	35-008	Surface Disposal/Landfill
35-009(a-c)	35-009(a-c)	35-009(a)	—	35-009(a)	Septic System
35-009(d-e)	35-009(d-e)	35-009(b)	—	35-009(b)	Septic System
35-009(f)	35-009(f)	35-009(c)	—	35-009(c)	Septic System
35-009(g)	35-009(g)	35-009(d)	—	35-009(d)	Septic System
35-009(h)	35-009(h)	35-009(c)	—	35-009(c)	Septic System Distribution Box
—	—	—	35-009(e)	35-009(e)	Septic System
35-010(a-d)	35-010(a-d)*	35-010(a-c)	35-010(misc. =e)	35-010(a-e)	Sanitary Lagoon and Sand Filters
35-011(a-b)	35-015(b)	—	35-011(c-d)	35-011(a-d)	Active Underground Tanks (USTs)
35-012	—	35-012(a)	35-012(b)	35-012(a-b)	Underground Storage Tanks
35-013(a-d)	—	—	—	35-013(a-d)	Sumps
35-014	35-014	35-014(a-b)	—	35-014(a-b)	Operational Releases

TABLE 1-1 (continued)

CURRENT LISTING OF OPERABLE UNIT 1129 SWMUs AND AOCs AS OF 1990

SWMUs Listed in 1988 SWMU Report[a]	SWMUs Listed in Tables A and B of HSWA Module[b]	Renumbered SWMUs (as of 1990)[c]	Additional SWMUs or Areas of Concern[c] (as of 1990)	Current Listing of SWMUs and Areas of Concern[c] (as of 1990)	SWMU Description
—	—	—	35-014(c-g)	35-014(c-g)	Operational Releases
35-015(a-b)	35-015(b)	—	–	35-015(a-b)	Decommissioned Waste-Oil Treatment
—	—	—	35-016(a-q)	35-016(a-q)	Drains and Outfalls
—	—	—	35-017	35-017	Soil Contamination from Reactor Operations
—	—	—	35-018(a-b)	35-018(a-b)	Leaking PCB Transformers
—	—	—	C-35-001	C-35-001	Former UST Location
—	—	—	C-35-002	C-35-002	Former UST Location
—	—	—	C-35-003	C-35-003	Former UST Location
—	—	—	C-35-004	C-35-004	Oil Spill
—	—	—	C-35-005	C-35-005	Oil Spill
—	—	—	C-35-006	C-35-006	Organic Waste Spill
—	—	—	C-35-007	C-35-007	Unknown Spilled Material
—	—	—	C-35-008	C-35-008	Leaking PCB Transformer
Technical Area 42					
42-001	—	—	—	42-001(a-c)	Incinerator Complex
42-002	—	42-002(a)	42-002(b)	42-002(a-b)	Decontamination Facility
42-003	—	—	—	42-003	Septic System
42-004	—	—	—	42-004	Canyon Disposal
—	—	—	C-42-001	C-42-001	Canyonside Disposal Area

TABLE 1-1 (continued)

CURRENT LISTING OF OPERABLE UNIT 1129 SWMUs AND AOCs AS OF 1990

SWMUs Listed in 1988 SWMU Report[a]	SWMUs Listed in Tables A and B of HSWA Module[b]	Renumbered SWMUs (as of 1990)[c]	Additional SWMUs or Areas of Concern[c] (as of 1990)	Current Listing of SWMUs and Areas of Concern[c] (as of 1990)	SWMU Description
Technical Area 48					
48-001	—	—	—	48-001	Air Exhaust System
48-002(a)	48-002(a)	—	—	48-002(a)	Container Storage Area
48-002(b)	48-002(b)	48-002(c)	—	48-002(c)	Container Storage Area
—	—	—	48-002(b,d-e)	48-002(b,d-e)	Container Storage Areas
48-003(a-b)	48-003(a-b)	48-003	—	48-003	Inactive Septic System
48-004(a-d)	—	—	—	48-004(a-d)	Sumps and Tanks
48-005	48-005	—	—	48-005	Waste Lines
48-006	—	—	—	48-006	Active Septic System
—	—	—	48-007(a-f)	48-007(a-f)	Drains and Outfalls
—	—	—	48-008	48-008	Leakage from PCB Transformers
—	—	—	48-009	48-009	Soil Contamination from Air-Compressor Operations
—	—	—	48-010	48-010	Surface Impoundment
Technical Area 52					
52-001(a-d)	52-001(a-d)	—	—	52-001(a-d)	UHTREX Equipment
52-002(a-b)	52-002(a-b)	52-002(a)	—	52-002(a)	Active Septic System
52-002(c,h,i)	52-002(c,h,i)	52-002(b)	—	52-002(b)	Active Septic System
52-002(d)	52-002(d)	52-002(c)	—	52-002(c)	Active Septic System
52-002(e)	52-002(e)	52-002(d)	—	52-002(d)	Active Septic System
52-002(f-g)	52-002(f-g)	52-002(e)	—	52-002(e)	Active Septic System
52-002(j)	52-002(j)	52-002(f)	—	52-002(f)	Active Septic System

TABLE 1-1 (continued)

CURRENT LISTING OF OPERABLE UNIT 1129 SWMUs AND AOCs AS OF 1990

SWMUs Listed in 1988 SWMU Report[a]	SWMUs Listed in Tables A and B of HSWA Module[b]	Renumbered SWMUs (as of 1990)[c]	Additional SWMUs or Areas of Concern (as of 1990)	Current Listing of SWMUs and Areas of Concern[c] (as of 1990)	SWMU Description
52-002(k)	52-002(k)	63-001(b)	—	63-001(b)	Active Septic System
—	—	—	52-002(g)	52-002(g)	Active Septic System
52-003	—	—	—	52-003	Waste Treatment Facility
52-004	—	—	—	52-004	Inactive Outfall
—	—	—	C-52-001	C-52-001	Potential Release Site
—	—	—	C-52-002	C-52-002	Potential Release Site
Technical Area 55					
55-001	—	—	—	55-001	Cement Plant
55-002	—	55-002(a)	—	55-002(a)	Radioactive Waste Container Storage Area
—	—	—	55-002(b)	55-002(b)	Radioactive Waste Container Storage Area
55-003	—	—	—	55-003	Containment Area
55-004	—	—	—	55-004	Evaporator
55-005	—	—	—	55-005	Filtration Unit
55-006	—	—	—	55-006	Glass Breaker
55-007	—	—	—	55-007	Thermal Treatment Units
55-008	—	—	—	55-008	Sumps and Tanks
55-009**	—	—	—	—	2 USTs (Delisted in 1989)
55-010	—	55-009	—	55-009	Monitoring Sump
55-xxx	—	55-010	—	55-010	Solvent Spills
—	—	—	55-011(a-e)	55-011(a-e)	Drains and Outfalls
—	—	—	55-012	55-012	Inactive Hazardous Waste Container Storage Area
—	—	—	55-013(a-b)	55-013(a-b)	Active Hazardous Waste Container Storage Areas
—	—	—	C-55-001	C-55-001	MEK/Solvent Spill

TABLE 1-1 (continued)

CURRENT LISTING OF OPERABLE UNIT 1129 SWMUs AND AOCs AS OF 1990

SWMUs Listed in 1988 SWMU Report[a]	SWMUs Listed in Tables A and B of HSWA Module[b]	Renumbered SWMUs (as of 1990)[c]	Additional SWMUs or Areas of Concern[c] (as of 1990)	Current Listing of SWMUs and Areas of Concern[c] (as of 1990)	SWMU Description
Technical Area 63					
52-002(f-g)	52-002(f-g)	63-001(a)	—	63-001(a)	Active septic system
52-002(k)	52-002(k)	63-001(b)	—	63-001(b)	Active septic system

Note: The — symbol means that the column heading is not applicable.

a International Technology Corporation (1988, 0329).
b HSWA Module VIII of the Laboratory's Hazardous Waste Permit (NM0890010515) (EPA 1990, 0306).
c Areas of Concern are listed in Appendix C of LANL (1990, 0145).

* Table B priority SWMUs from HSWA Module VIII of the Laboratory's Hazardous Waste Permit (NM0890010515) (EPA 1990, 0306).
** SWMU delisted in 1989; USTs were used for product storage.

SWMU No. 35-002, Material Disposal Area X: MDA-X, SWMU No. 35-002, lies under 0.05 acres of parking lot near the southeast corner of building TA-35-2 (DOE 1987, 0264) (Figure 3-3). It is the burial site for the LAPRE II reactor, which was defueled and decommissioned in 1959 (Harper 1979, 04-0097). Portions of the reactor that were buried in place included the reactor pressure vessel, the fuel reservoir, the connecting pipe, and possibly other components (Warren 1974, 04-0197; Montoya personal communication in Roberson 1991, 04-0227). The 2-ft-diameter reactor pressure or "core" vessel is located inside an 8-ft-diameter, heavy-walled, stainless-steel vessel. The fuel reservoir is a copper-lined stainless-steel tank approximately 1 ft in diameter by 10 ft in length. The reservoir and pipe are contaminated with residual $^{235}UO_2$/phosphoric acid fuel solution and associated fission products. When buried, the space between the core and the outer vessel was filled with sand. Although the $^{235}UO_2$ fuel solution was drained from the reactor and fuel reservoir in 1959, as much as 30 g (0.1 Ci) of the liquid fuel solution and neutron-activation and fission products were believed to remain within the system (Warren 1974, 04-0197; Graf and Howard 1978, 04-0090). After removing the fuel solution, the outer vessel was capped and both the vessel and fuel reservoir were buried in place, about 8-ft-below grade. The area was later covered with soil and asphalt. Also remaining inside the reactor is approximately 50 kg of radioactively contaminated gold, which was used as a corrosion-resistant lining of internal parts.

LAPRE II and associated structures were removed from MDA-X in the summer of 1991, under the Laboratory Work Order No. 6575723 (Gonzales 1991, 04-0089). Details of the removal are discussed in Section 3.3.2.4, Environmental Surveys and D&D Activities. Soil sampling carried out as part of the 1990 site characterization (Phase I of the D&D effort) revealed minimal soil contamination at a depth of 15 ft on the east side of the reactor. One sample collected from the sand backfill material 2 ft from the reactor contained ^{152}Eu as the primary contaminant at 217 pCi/g (Montoya 1990, 04-0161). ^{137}Cs was also discovered in the soil in concentrations up to 8 pCi/g (Montoya personal communication in Roberson 1991, 04-0227). Five other holes drilled for samples yielded no radioactive contamination.

After the reactor, associated structure and components, and contaminated soil were removed, a 20-ft-square grid was established on the bottom and sides of the pit. On September 23, 1991, the Environmental Protection Group (EM-8) collected 15 composite soil samples from the bottom, sides, and top edge of the pit using this grid. Samples were submitted to the Health and Environmental Chemistry Group (EM-9) for analysis for radionuclides and hazardous waste. Soil sample measurements indicated that no areas of concern exist. Under the Radiological Site Assessment Program, Oak Ridge Associated Universities independently assessed the remedial action done at the LAPRE II site. The assessment verifies the data supporting the adequacy of remedial action and confirms the radiological conditions are within established guidelines for this project (Montoya 1993, 04-0294).

SWMU Nos. 35-003(a through g), Wastewater Treatment Plant: A wastewater treatment plant located at the east end of Ten Site Mesa (Figure 3-5) operated from 1951 until 1963. It consisted of waste lines, storage tanks, an Air Filter Building, ion-exchange columns, and chemical-treatment and precipitation tanks. The facility, formerly referred to as "Area W" (not equivalent to MDA-W), covered

an area of 1.7 acres. Plant operations began in 1951 as a simple system of holding tanks, but by 1963 the plant had grown into a complex operating facility, consisting of the structures listed in Table 3-13 (SWMU Nos. 35-003[a through q]), plus an array of underground pipelines (SWMU No. 35-003[miscellaneous]) and overhead air-filtration ducts. The locations of these structures are shown in Figure 3-5.

Waste treated at this plant originated from the radiochemistry laboratories and operations of the radioactive ^{140}La hot cells in TA-35-2, at which kilocurie sources of ^{140}La were prepared. The radioactivity in the waste was the result of ^{140}Ba, ^{140}La, ^{89}Sr, ^{90}Sr, and ^{90}Y isotopes, as well as traces of other radionuclides such as ^{137}Cs and ^{106}Ru (Emelity 1958, 04-0060). **Contaminated exhaust air and liquid wastes from laboratory building TA-35-2 were separated in a structure designated as TA-35-3, the phase separator pit (SWMU No. 35-004[n]). The liquid waste** was stored in three 600-gal. reinforced-concrete underground storage tanks (TA-35-4, -5, -6; SWMU Nos. 35-003[a, b, and c], respectively). The liquid was caustic-treated for acidity in these tanks and then routed to four 50,000-gal. concrete storage tanks (TA-35-10, SWMU No. 35-003[d]), which were designed to provide an estimated six-month holding time to allow for decay of ^{140}La and ^{140}Ba.

Air ducts carried the exhaust air from building TA-35-3, the phase separator pit, into five scrubber systems and stacks in the Air Filter Building (TA-35-7, SWMU No. 35-003[p]). There, the contaminated air passed through a series of air-cleaning filters, which were washed by tap water and/or long-decayed waste from the tank farms. This method, which relied on high-evaporation loss in the filters, was expected to balance the incoming waste volumes. In practice, the system worked as designed, with ^{140}La and ^{140}Ba decaying out. Other radionuclides, however, became concentrated during storage and evaporation. ^{90}Sr and ^{89}Sr became major constituents in the longest-stored wastes, accounting for over 50% of the remaining activity. Buildup of radiostrontium in the "closed system" became a problem in the air-cleaning equipment and required numerous hot cell washings, which in turn produced greater volumes of radioactively contaminated wastewater. The large volumes of wastewater overwhelmed the storage capacity of the system, and led to spills, overflows, and unplanned releases of waste into the canyon (SWMU No. 35-003[r]) (Emelity 1958, 04-0060).

Concentrations of ^{90}Sr up to 1,000 times discharge tolerance sometimes prevented discharge of the wastewater and required adding equipment for removing strontium. In 1955, a single-column cation exchanger designed for removing ^{90}Sr in the acid cycle was added to the system in TA-35-7. The success of this column justified the building of a pilot-plant scale unit for removing ^{90}Sr from the waste. The pilot plant was built in a corner of TA-35-7 and consisted of a flow-rate regulator and a resin column 16 in. in diameter by 8 ft high with 5 ft^3 of cation-exchange resin. The plant also required the addition of a regeneration acid tank with air-pressure controls; a 150-gal. hopper-bottomed, spent-regenerant tank with a flash mixer, and drains for supernatant and sludge removal (TA-35-38, SWMU No. 35-003[g]); and a 1,000-gal. concrete sludge tank (TA-35-22, SWMU No. 35-003[m]). The system could treat waste from any one of the four tanks in TA-35-10 (SWMU No. 35-003[d]). Because of erratic results and gamma radiation buildup at the exchange columns and equipment, the plant was redesigned with an additional resin column, automatic pH control, electronic-operating controls, and lead shielding for operator protection (Emelity 1958, 04-0060).

In 1958, a second ion-exchange column was added at TA-35-7. The new ion-exchange unit consisted of two columns containing a total of 10 ft^3 of Dowex 50 resin and necessary pumping, control, and regenerating equipment for acid

TABLE 3-22 (concluded)

WASTEWATER TREATED AT THE TA-35 TREATMENT FACILITY (1955-1963)

Year	Month	Total Treated [a]	Comments
1963	Jan.	—	Storage only.
	Feb.	—	Storage only.
	March	—	Storage only.
	April	105,530	
	May	—	Storage only.
	June	—	Storage only.

Source: LASL (circa 1972, 04-0145).
[a] Volume of waste treated is in gallons.

Oil Spills

Numerous oil spills have occurred at TA-35, primarily in the 1980s. Most spills are from siege tanks and holding tanks for dielectric oils used in capacitors and Marx generators associated with laser operations. Oil spill areas designated as SWMUs and AOCs have been discussed in Section 3.3.2.1, Waste Management Activities. SWMUs related to oil spills include SWMU Nos. 35-011(b and c), 35-016(f, l, and n), and 35-018(a and b). Also, AOCs involving oil spills and potential oil releases include C-35-001, C-35-002, C-35-003, C-35-004, C-35-005, and C-35-008.

Atmospheric Releases

Both planned and unplanned releases of radioactive constituents to the atmosphere have occurred at TA-35. **A thorough review of documented stack emmisions revealed that only radionuclides were released.** Radionuclides released to the atmosphere during early operations at TA-35 were primarily ^{140}La and ^{90}Sr. These radionuclides were released from TA-35-7, the Air Filter Building, during operation of the radioactive lanthanum-140 program (^{140}La source processing) during the 1950s (LASL circa 1973, 04-0147). No data have been obtained that provide information on quantities of radionuclides released while the ^{140}La source processing program was in operation. Significant atmospheric releases are suspected. In 1956, air samples taken during a run in the ^{140}La hot cell were determined to be "too hot to count." Modifications were made to continuously monitor emissions from the Ten Site stack (H-Division 1956, 0473), but monitoring data have not been found.

In the mid to late 1950s, experimentation with other radionuclides (primarily plutonium and tritium) began in TA-35-2. Quantities of normal airborne releases of radionuclides from TA-35-2 from 1967 through 1971 are presented in Table 3-23.

In 1972, airborne radioactive effluent from TA-35 included minor amounts of ^{238}Pu and ^{239}Pu and significant releases of tritium (Herceg 1973, 0440). Thousands of curies of tritium were released to the atmosphere each year from the tritium facility in TA-35-2 between 1953 and 1974 (Harper and Garde 1981,

equipment and piping was documented in the mid-1970s (Jordan 1975, 04-0104; Garde 1976, 04-0085). Because of the extreme radiation hazard to workers in TA-35-2, the tritium facility was considered a very high priority for D&D (second of all Laboratory facilities) in the "LASL Ten-Year Decontamination/Decommissioning Site Plan" (LASL 1977, 0649). Removal and decontamination of the gloveboxes was considered to be the highest priority at the Laboratory in a DOE National D&D Planning Survey (Garde 1978, 04-0086).

Removal of the "tritium works" was accomplished during April until June 1979 (Winburn 1979, 04-0201). Decommissioning generated almost 600 ft^3 of waste contaminated with an estimated 6,000 Ci of tritium. which was disposed of in a pit at TA-54. Also, of the 1,300 Ci of tritium released to the atmosphere from TA-35-2 in 1979, 1,080 Ci can be attributed to D&D activities (Harper and Garde 1981, 0458). Laboratory personnel certified adequate decontamination of the glovebox room in TA-35-2 (Harper 1979, 04-0096). However, cleanup of soils contaminated by atmospheric release of tritium was not addressed in the decontamination of the tritium facility. Uptake of tritium and other radionuclides by fruit trees on the south side of TA-35-2 near the tritium exhaust stack suggests soils at the east end of TA-35 may be contaminated with tritium (refer to SWMU No. 35-014[a]).

The three reactors that operated at TA-35 between 1956 and 1964 (LAPRE I, LAPRE II, and LAMPRE I) have all been disassembled and decommissioned. Details on these experimental reactors are given in the discussions of SWMU No. 35-002 (MDA-X) and SWMU No. 35-017 (Soil Contamination from Reactor Operations). LAPRE I was built in 1955 in the basement of TA-35-2, and operated less than one year, beginning in February 1956 (H-Division 1955, 0482; H-Division 1956, 0468). The disassembly of LAPRE I and the removal of associated waste lines is mentioned in the H-Division Progress Report (H-Division 1957, 0474). The fate of this reactor after discontinuation of operation is poorly documented, but the LAMPRE reactor was built at the former site of LAPRE I, and at least portions of LAPRE I may have been used in construction of LAMPRE (LANL 1990, 0145).

LAPRE II was constructed in a pit south of TA-35-2 in the late 1950s, operated from February until May of 1959, and was defueled and disassembled the same year (H-Division 1959. 0480; LASL 1977, 0649; Montoya 1991, 04-0162). The reactor was fueled by a solution of $^{235}UO_2$ dissolved in 95% phosphoric acid, and was cooled by water and moderated by phosphoric acid and water (Montoya 1991, 04-0162). The reactor vessel, a fuel reservoir, and the pipe that connected the two were buried in place about 8 ft below grade and covered with dirt and asphalt in 1968 (Garcia 1968, 04-0084; Warren 1974, 04-0197) at the site called MDA-X (SWMU No. 35-002). All other equipment associated with LAPRE II was removed in 1959; the location to which this material was taken is not documented (LASL 1977, 0649). The reactor vessel and related systems are expected to be neutron-activated and contaminated with fission products (Montoya 1991, 04-0162). The fuel reservoir is thought to contain an estimated 30 g (0.1 Ci) of residual ^{235}U fuel solution (Warren 1974, 04-0197; Graf and Howard 1978, 04-0090). Excavation and removal of LAPRE II to TA-54 was planned as part of the "LASL Ten-Year Decontamination/Decommissioning Plan" for the 1980s, but because of the low-level radiation hazard was given relatively low priority (16 out of 17 D&D projects) (LASL 1977, 0649).

Removal of the LAPRE II reactor and fuel reservoir was completed in December 1991 (Montoya 1993, 04-0294) under Work Order No. 6575723 (Gonzales 1991, 04-0089). The goals of this D&D project included the removal and disposal of the reactor vessel, the fuel reservoir, the connecting pipe, and contaminated soil in accordance with DOE guidelines. Soils were monitored for radioactive and hazardous chemical contamination during the excavation process.

After the reactor, associated structure and components, and contaminated soil were removed, a 20-ft-square grid was established on the bottom and sides of the pit. On September 23, 1991, the Environmental Protection Group (EM-8) collected 15 composite soil samples from the bottom, sides, and top edge of the pit using this grid. Samples were submitted to the Health and Environmental Chemistry Group (EM-9) for analysis for radionuclides and hazardous waste. Soil sample measurements indicated that no areas of concern exist. Under the Radiological Site Assessment Program, Oak Ridge Associated Universities independently assessed the remedial action done at the LAPRE II site. The assessment verifies the data supporting the adequacy of remedial action and confirms the radiological conditions are within established guidelines for this project (Montoya 1993, 04-0294).

The vertical sodium tanks, in which contaminated liquid sodium coolant from the LAMPRE reactor was disposed (MDA-W, or SWMU No. 35-001), were decommissioned in 1980 during the "Surplus LASL Facility Disposition Project." This process consisted of the removal of the metal shed that covered the aboveground portions of the tanks, and then of the entombment of the tanks in a concrete structure (TA-35-43) (LANL circa 1981, 04-0209).

3.3.3 Regulatory Activities

3.3.3.1 Permits

Permits associated with TA-35 operations other than the NPDES permits for the drains and outfalls do not exist. NPDES permitted outfalls are discussed in Section 3.3.2.1, Waste Management Activities, under SWMU No. 35-016.

3.3.3.2 Interim Corrective Measures

Surface impoundments listed as SWMU No. 35-005(a and b) and SWMU No. 35-006 were closed under RCRA interim status closure standards in 1989. As part of the closure procedure at SWMU No. 35-005(a), a UST (SWMU No. 35-012[a]), which was connected to the surface impoundment, was removed in 1990. The final closure report and closure certification letter for these closure procedures were submitted to NMED in 1991. Also, two USTs listed as SWMU No. 35-011(d) were removed in accordance with NMED UST regulations in 1991. Other interim corrective measures taken at TA-35 include the 1991 removal and decontamination of LAPRE II (SWMU No. 35-002) and the planned removal and decontamination of the phase separator pit (SWMU No. 35-003[n]) and associated underground holding tanks (SWMU Nos. 35-003[a, b, and c]). These corrective measures are being conducted by Group EM-7 (formerly Group HSE-7) of the Laboratory with concurrence from the EPA.

3.4 Description of Former TA-42, Incinerator Site

3.4.1 Site Location and Physical Description

Former TA-42 was located within the current boundaries of TA-55, the Plutonium Processing Facility. In 1951, an incinerator was built at this site for volume reduction of low-level plutonium-contaminated wastes.

5.0 TECHNICAL APPROACH

The goal of this Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) is to ensure that the environmental impacts associated with past and present activities within Operable Unit (OU) 1129 are thoroughly investigated in compliance with Los Alamos National Laboratory's (the Laboratory's) RCRA Part B (Hazardous and Solid Waste Amendments [HSWA] Module) permit. To accomplish this goal, the nature and extent of contamination must be identified, and risk must be assessed for human and environmental receptors along any reasonable environmental pathways that may lead to exposure. The technical approach used in this Work Plan focuses efforts on meeting required site characterization objectives in a cost-effective manner. This approach uses a health-risk-based decision-making process (consistent with the Laboratory Installation Work Plan [IWP] [LANL 1991, 0553] and proposed Subpart S to 40 Code of Federal Regulations [CFR] 264) for recommending solid waste management units (SWMUs) for no further action (NFA) or for further study of possible remedial actions under a corrective measures study (CMS). As discussed in Chapter 1.0, a decision analysis approach will be employed in the RFI report and CMS to manipulate data gathered as a result of the RFI.

5.1 Summary of the OU 1129 Technical Approach

The basic technical approach for OU 1129 is summarized as follows:

- Archival data is gathered from available sources to help define a basic understanding of the processes and events that produced each SWMU and the contaminants of concern (COCs) that may be present at each SWMU.

- The archival data is evaluated to identify those SWMUs for which no potential hazard exists so that the number of sites that must undergo field investigation can be reduced.

- The SWMUs that require field investigation are assessed on the basis of archival information to determine whether the initial characterization effort will be a broad-based Phase I field investigation or a more detailed Phase II investigation.

- Phase I field investigations are carried out where needed to determine the presence or absence of COCs and to supplement existing information on source terms or site conditions.

- Data gathered during Phase I investigations are used to determine which SWMUs need further characterization and which may be recommended for NFA. For SWMUs that require further study, Phase I data are used and modeled to help design Phase II sampling and analysis plans (SAPs). The RFI Work Plan will be amended and submitted for Environmental Protection Agency (EPA) review and approval when Phase II SAPs are completed for sites requiring Phase II investigation. Interim phase reports will be submitted at least quarterly as characterization work proceeds.

- Phase II field investigations are conducted where appropriate to characterize the nature and extent of contamination and to obtain the data necessary for a quantitative assessment of risk posed by COCs.

- Quantitative risk assessment is conducted for each site once the data needs are satisfied by the field investigation.

- An RFI report is compiled that contains the results of field investigations and recommendations for SWMUs evaluated by the decision process. SWMUs are recommended for CMS when the **95% upper-confidence limit (UCL) on the arithmetic mean concentration of an individual site contaminant exceeds the screening action level (SAL) for that contaminant, or when** aggregate risk assessment results exceed the programmatic threshold; the remaining SWMUs are recommended for NFA. Recommendations of NFA will be supported by appropriate criteria, which are discussed in the following text.

The technical approach and decision process used in this Work Plan are discussed in detail in the following sections.

5.2 OU 1129 Decision Process

All SWMUs within OU 1129 are evaluated using the four-step decision process illustrated in Figure 5-1. Italicized terms used in this diagram are defined in Table 5-1. Each of the four diamonds in the diagram represents a point at which a decision is or will be made for each SWMU under consideration. To ensure simplicity in the process, each question posed has only two possible answers, "yes" or "no." The process is designed to identify those SWMUs that can be recommended for NFA as early in the process as possible, with the least expenditure of resources. Those SWMUs that cannot be recommended for NFA after Phase I and II investigations and risk assessment are complete will be candidates for a CMS. Candidate SWMUs for voluntary corrective action/interim action will be identified as appropriate within the process.

Module VIII of the HSWA permit establishes Corrective Action Requirements (CARs). Task IV, Investigative Analysis, specifies that the permittee must identify all relevant and applicable standards for the protection of human health and the environment. Task VI, Identification and Development of the Corrective Action Alternative or Alternatives, further specifies that based on the results of the RFI, the permittee must identify, screen, and develop the alternatives for removal, containment, treatment, and/or remediation of contamination on the basis of objectives established for corrective action. Cleanup requirements can be divided into three categories: (1) contaminant-specific requirements that address specific contaminants, (2) location-specific requirements that are based on a specific site setting, and (3) action-specific requirements associated with specific response actions. In the absence of the SWMUs being investigated, the identification of potential CARs at this time would be premature. The full tabulation of potential location-specific, contaminant-specific, and action-specific requirements will be provided in future technical reports as adequate SWMU information is obtained through the RFI process.

5.2.6 Risk Assessment Process

Because health-risk-based assessment is integral to the Laboratory RCRA process, all SWMUs in OU 1129 that undergo Phase II investigation will include an assessment of risk. This assessment will include the total data set, which is obtained through archival review and Phase I and/or Phase II sampling activities, for each SWMU. The risk assessment methodology for OU 1129 will reflect the guidance set out in proposed Subpart S to 40 CFR 264 and the ER Program Office's 1992 IWP. DQOs for Phase II investigations at OU 1129 will include any requirements, as these requirements are available from the Laboratory ER Program Office, specific to the gathering of data for risk assessment not otherwise covered. The risk assessment results will serve as input to Decision Point 4.

5.2.7 Decision Point 4:

Do contaminants of concern at this SWMU exceed action levels or have an aggregate risk above the ER Program threshold value?

Decision Point 4 is the final step in the decision process and functions as a point at which SWMUs that have undergone field investigations will be recommended either for CMS or NFA. The purpose of Decision Point 4 is to evaluate the total set of validated data now available for each SWMU. Concentrations of individual COCs at each SWMU will be compared to the action level for that COC, and the calculated aggregate risk from COCs at the SWMU will be compared to the acceptable aggregate risk values determined by the ER Program Office. Risk assessment methodologies to be adopted by the Laboratory are assumed to reflect the basic concepts of the proposed Subpart S to 40 CFR 264; calculation of risk as additive for sites with multiple contaminants is assumed. A recommendation of NFA at this point in the decision process will be justified for a SWMU if each of the following criteria are met:

- **the 95% UCL on the arithmetic mean concentration of an individual site contaminant does not exceed the SAL for that contaminant, and**
- the aggregate risk value for the sum of the health-risk-quantified COCs present does not exceed the acceptable risk value set by the ER Program Office.

The analysis of data during the OU 1129 RFI investigation will follow EPA and Laboratory IWP guidance for using a **95%** (one-tailed) confidence interval. Uncertainty will be handled according to methods shown in Appendix H of the Laboratory IWP (LANL 1991, 0553) and applicable EPA documents.

A CMS (or an alternative response action) is required for SWMUs in which one or more COC is present at a level that exceeds the risk-based action level specified in 40 CFR 264 Proposed Subpart S for that constituent, or in which the cumulative risk posed by two or more COCs exceeds acceptable levels. For radionuclides, numbers for comparison to analytical values are expected to be published in a future Laboratory IWP or some future EPA guidance document. However, pending further ER Program Office guidance, the need to carry a SWMU into the CMS or for corrective action whenever COCs are detected in concentrations that exceed Subpart S action levels may not be necessary. If further site-specific risk assessment indicates that human health and the environment are not at risk (e.g., if no plausible pathway exists from source to potential receptors), then no further action may be appropriate. The ER Program Office is expected to promulgate criteria for this circumstance.

5.3 Data Quality Objectives

Data must be collected at three stages in the decision process. The first stage involves the initial collection of pertinent archival information. This information serves as data input for Decision Points 1 and 2. The data required to make a decision at Decision Point 3 are collected during Phase I sampling, the second stage of data collection. Phase II sampling is the third stage of data acquisition. The data needs for Decision Point 4 determine the scope of Phase II efforts.

Because these decisions must be technically sound and validated to be defensible, an attempt has been made to collect as much reliable archival information about each site as possible. To ensure that data of appropriate and sufficient type, quantity, and quality are collected during Phase I and Phase II sampling, the DQO process has been applied to the development of the Phase I and Phase II SAPs. These SAPs are presented in Chapter 7.0 of this Work Plan.

The DQO process is a seven-step process developed by the EPA for planning effective and efficient data collection programs (EPA 1987, 0086). A well-planned data collection program will ensure that the right type, amount, and quality of data are collected. Quality environmental data are needed to make defensible environmental decisions.

The DQO process is a valuable tool for the following reasons:

- it provides a logical, iterative structure for study planning and encourages focusing on critical questions,
- it provides a focused method to determine data needs,
- it helps data users plan for uncertainty, and
- it facilitates communication among the technical team members and minimizes the amount of time and money spent collecting data.

The seven steps in the DQO Process are as follows:

1. State the problem to be resolved.
2. Identify the decision to be made (or the question that must be answered).
3. Identify input to the decision (or identify data needs).
4. Specify the domain of the decision.
5. Develop a decision rule (or logic statement).

SWMUs RECOMMENDED FOR NFA AT DECISION POINT 1

SWMU No. and Type	NFA Criteria A	B	C	D	Description/Justification	References
5-006(a) Former building location				•	**SWMU No. 5-006(a) is the former site of building TA-5-1. TA-5-1 was a trim shack transferred from TA-18 around 1948 or 1949 to be used as office and lab space. The building was found to be contaminated with HE during a survey in 1959. The site was monitored in 1973 and found to be free of detectable radioactive contamination . The building had been destroyed prior to the LASCP in 1985, when the site was reclaimed. TA-5-1 was monitored with a Harshaw Model 301 phoswich and no contamination was detected in 1985. There are no documented releases of HE to the environment at TA-5-1. Soil has been moved from TA-5-1 to fill excavations at TA-5-9 and TA-5-15. Due to the lack of archival evidence of releases of RCRA hazardous wastes or radioactive wastes to the environment, this site is recommended for NFA.**	**Martin 1973, 04-0151; Scholl Fritz, 1985, 04-0082; Dubois and Baytos 1972, 04-0271; LANL 1990, 0145**
5-006(d) Former building location				•	SWMU No. 5-006(d) was the site of a laboratory (TA-5-6) built in 1944. The building was found to be free of radioactive contamination in 1959 and of toxic materials, but was found to be contaminated with HE and was burned . Surface debris was removed and site was recontoured to existing terrain 1985. Due to the lack of archival evidence of releases of RCRA hazardous wastes or radioactive wastes to the environment, this site is recommended for NFA.	Blackwell 1959, 04-0026; Schulte 1959, 04-0184; Wingfield, 1960, 04-0202; LANL 1990, 0145.
5-006 (f-g) Former building location				•	SWMU Nos. 5-006(f) and (g) are the sites of magazines TA-5-2 and TA-5-3. The buildings were built in 1945, and because they were found to be contaminated with HE were burned in 1960. Miscellaneous building debris was removed during the D&D efforts of the LASCP 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,-7,-9 and -15. Soil from TA-5-2 was used to backfill TA-5-7, -9, and -15. After the areas were cleared of debris, they were contoured to existing terrain and reclaimed. Due to the lack of archival evidence of releases of RCRA hazardous wastes or radioactive wastes to the environment, this site is recommended for NFA.	LANL, 1990, 0145; Wingfield 1960, 04-0202; Dubois and Bayots, 1972, 04-0271.

SWMUs RECOMMENDED FOR NFA AT DECISION POINT 1

SWMU No. and Type	NFA Criteria A	B	C	D	Description/Justification	References
C-4-001 Former building location				•	Area of concern C-4-001, consists of potential soil contamination beneath several structures at TA-4. TA-4-1, TA-4-2, 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 were built in 1945, TA-4-1 was demolished in 1985 and the other buildings were demolished in 1956. All sites were monitored for radioactivity and the surface was reclaimed during the LASCP D&D project in 1985. There is no archival evidence of releases of RCRA hazardous wastes or radioactive wastes to the environment at these sites and they are therefore recommended for NFA	LASL no date, 0402; Scholl 1989, 0485
C-5-001[a] Former building location				•	Area of concern C-5-001 consists of potential soil contamination associated with TA-5-8, a storage building and TA-5-21, a maintenance building. TA-5-21 is a maintenance building that was located west of the calibration chamber TA-5-20. Its location suggests that the building was used to house equipment used in association with work conducted in the calibration chamber. It was reported to be free of detectable radioactivity in 1976. There is no documentation that hazardous materials were stored in the maintenance building and it is recommended for NFA. TA-5-8 is a storage building built in 1944 adjacent to steel barricade firing pit #1 (TA-5-7) and was removed in 1950. There is no documentation that states that hazardous materials were stored in the building. Due to its location adjacent to the firing pit, the area was probably contaminated with HE and uranium. The site was D&Ded during the LASCP cleanup in 1985. The site is included in the area to be studied during the Phase I sampling of SWMU No. 5-001(a), Aggregate B, in Section 7.6, and therefore a separate sampling program is unnecessary.	Blackwell 1976, 04-0028; LANL no date, 0202.
5-003* Calibration Chamber	•	•			SWMU No. 5-003 consists of a 35-ft-deep shaft or calibration chamber excavated into the tuff (see Section 3.2.2.1). The chamber is lined with lead bricks and has been backfilled with soil. Instruments with sealed radioactive sources were calibrated in this chamber, but there is no reason to suspect release of radionuclides. The lead bricks are the only potentially hazardous material remaining at this site. However, because of the low solubility of solid lead at normal pH, the bricks do not pose an environmental hazard. The pH of the immediate environment would have to be lowered to extremely acidic conditions to enable the lead to dissolve and migrate from the site. No further action (NFA) is recommended because there is no reason to suspect soil contamination in the vicinity of the chamber.	1990 SWMU report (LANL 1990, 0145); Janecky 1992, 04-0234.

[a] This area of concern is also addressed in the text of Aggregate R since it does not entirely fall under the requirements for NFA.

* Designated as an HSWA Module SWMU (LANL 1990, 0145).

SWMUs RECOMMENDED FOR NFA AT DECISION POINT 1

SWMU No. and Type	NFA Criteria A	B	C	D	Description/Justification	References
C-35-001 C-35-002 C-35-003 Former UST Locations	•	•			SWMU Nos. C-35-001, C-35-002 and C-35-003 are locations of former USTs that were used to store fuel oil. SWMU No. C-35-001 (TA-35-18) was located north of the south wing of building TA-35-2, and SWMU No. C-35-002 and C-35-003 (TA-35-19 and TA-35-20) were located southeast of building TA-35-2 and were removed in 1988, and were reportedly in good condition with no visible evidence of contamination in the surrounding soils. No soil samples were collected when the tanks were excavated (McInroy 1991, 04-0219). Because there is no documented evidence of a source term or of release of COCs from these tanks, they are recommended for NFA.	LANL 1990, 0145
C-35-004 Former UST Location	•			•	Area of concern C-35-004 was the site of a 1000 gallon Shell Dela Oil spill south of TA-35-125 that discharged into Ten Site Canyon through the storm sewer in 1986. The oil reached the canyon and extended 30 ft downstream. Analyses of the oil indicated that PCB content was below the detection limit. The spill was cleaned up using absorbent materials (Bohn 1986, 04-0030; Umphres 1986, 04-0193). Because this was a one-time spill event, and COCs were not found to be present, and efforts have been made to clean up this spill, this unit is recommended for NFA.	LANL 1990, 0145
C-35-005 C-35-006 Potential Release Sites	• •				Potential release site C-35-005 was a spill of 100 gal. of non-PCB-contaminated dielectric oil, and site C-35 006 was 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 (1986 and 1988, respectively). NFA is recommended for these sites because they involved one-time spills that were immediately cleaned up, and because the amounts of spilled materials remaining after cleanup do not present a risk to human health or the environment.	1990 SWMU report (LANL 1990, 0145); Bailey 1986, 04-0023.
C-35-006 Operational release				•	SWMU No. C-35-006 is the site of a spill of 5 gallons of organic waste (toluene, styrene, and water mixture) in the receiving area of TA-35-213 on May 25,1988. Group HSE-7 cleaned up the spill and all cleanup materials were placed in a 30 gallon drum. This area is recommended for NFA because it consists of a one-time spill which was cleaned up.	LANL 1990, 0145
C-35-008 Potential Release Site		•	•	•	Potential release site C-35-008 is a leaking PCB transformer (ID No. 5618) located in the basement of building TA-35-2 (see Section 3.3.2.1). The oil/water mixture that leaked from the transformer underwent cleanup under the Toxic Substance Control Act (TSCA). NFA is recommended because a potential release to the environment was prohibited by site design and conditions, and the transformer has been removed.	1990 SWMU report (LANL 1990, 0145).

SWMUs RECOMMENDED FOR NFA AT DECISION POINT 1

SWMU No. and Type	NFA Criteria A	B	C	D	Description/Justification	References
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 sealed, contains 150 liters 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 could not be released from the tubes unless the steel tubes were cracked. If the tubes were breached, the sodium would be expected to react explosively with moisture in the soil or tuff. Because the steel tubes have not shown signs of cracking, it is believed that no releases of sodium 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 site is recommended for NFA for the following reasons: no evidence of a release exists; the engineered controls presently in place preclude any migration of contaminants to the environment; assessment/remediation options pose a greater risk to human health and the environment than not investigating the site; and this site is designated as a MDA-W, which will be maintained under perpetual institutional control.	Warren 1974, 04-0197; LASL 1977, 0649; LANL 1981, 04-0209.
35-002* Material Disposal Area X (MDA-X)				•	SWMU No. 35-002, MDA-X, was the location 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). NFA is recommended for the following reasons: all reactor-related equipment and contaminated soils were removed; and confirmatory soil sampling was conducted to verify removal of all contaminants of concern (COCs) including radionuclides and hazardous chemicals.	Warren 1974, 04-0197; Montoya 1991, 04-0161; Fresquez 1991, 04-0080; Montoya 1991, 04-0162; Montoya pers. comm. in Roberson 1991, 04-0227; Montoya 1993, 04-0294.
35-003(i)*	•				SWMU No. 35-003(i) consisted 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. The tanks were moved from inside TA-35-27 in 1974. (The surge tanks were never associated with the wastewater treatment plant as is implied by their designation as a subunit of SWMU No. 35-003.) NFA is recommended for this SWMU because the tanks never managed RCRA hazardous or radioactive wastes.	DOE 1987, 0264; LASL no date, 0402.

* Designated as an HSWA Module SWMU (LANL 1990, 0145).

SWMUs RECOMMENDED FOR NFA AT DECISION POINT 1

SWMU No. and Type	NFA Criteria A	B	C	D	Description/Justification	References
35-003(p)		•		•	SWMU No. 35-003(p) is the former Air Filter Building (TA-35-7). This building was decontaminated and decommissioned in 1979 and 1980. This building housed air filtering equipment for treating contaminated air from building TA-35-2, the original laboratory/ office building completed in 1951. The removal of the building along with the material associated with the phase separator pit has been requested. This site is recommended for the following reasons: the building has previously undergone D&D activity; no evidence of a release exists following the 1980 D&D activity; this building is currently scheduled for D&D and removal	LANL 1981, 04-0209; Hansen and Umphres 1992, 04-0263.
35-004(c)		•			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 for the storage of drums of dielectric oil. The storage area is associated with the waste oil treatment system, SWMU 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. NFA is recommended for this site because site design precludes the migration of COCs to the environment.	1990 SWMU report (LANL 1990, 0145); Roberson 1991, 04-0226.
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, e, f, k, l, and n) are container storage areas located inside buildings (see Section 3.3.2.1). A site inspection in August 1991 revealed no evidence of spills at these sites. NFA is recommended for these sites because even if spills occurred at these storage areas, site design physically precludes migration of COCs to the environment. In addition, SWMU No. 35-004(n) is a HCRA-permitted waste storage area.	1990 SWMU report (LANL 1990, 0145); Roberson 1991, 04-0226.
35-004(i) Container Storage Area		•			SWMU 35-004(i) is an inactive container storage area located west of TA-35-244 where oils, capacitors, solvents, and Freon have been stored. No spills or stains have been reported, and the area is paved. It is not known if the asphalt was present during the period that the area was used as a storage area. Because there have been no reported spills or releases and transport of contaminants into the environment is mitigated by the presence of asphalt over the area, until the site is decommissioned this area is recommended for NFA.	LANL 1990, 0145

* Designated as an HSWA Module SWMU (LANL 1990, 0145)

SWMUs RECOMMENDED FOR NFA AT DECISION POINT 1

SWMU No. and Type	NFA Criteria A	B	C	D	Description/Justification	References
35-004(j) Container Storage Area		•			SWMU is 35-004(j) is an active container storage area located on a loading dock on the southwest side of TA-35-128 where oils, capacitors, solvents and Freon have been stored. During a 1988 ER Program site reconnaissance in 1988, stained soils were noted. Since then, this area has been asphalted, and the upper portion of the northern side of Ten Site Canyon has been shotcreted. The presence of the asphalt serves to isolate any present spills in this area from the environment, and asphalt and shotcrete prevent the infiltration of water into the surface where possible contamination may be present. Any contamination in this is considered to be under institutional control and recommended for NFA until the site is decommissioned.	LANL 1990, 0145
35-004(o) Container Storage Area		•			SWMU No. 35-004(o) is a container storage area at the north dock of building TA-35-213. Materials which have been stored at this area include solvents, chemicals and Kimwipes. This storage area is located inside a security fence on a large expanse of concrete and asphalt. No releases from the area have been documented and no evidence of spills are reported in the documentation. This site is recommended for NFA because the site design precludes releases from the SWMU.	LANL 1990, 0145
35-005(a) 35-005(b) 35-006* Inactive Surface Impoundments				•	SWMUs Nos. 35-005(a and b) are the former sites of 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 was an unlined waste oil impoundment that was replaced by SWMU No. 35-005(a) in 1985. (Because SWMU Nos. 35-006 and 35-005[a] occupied the same site, all remedial actions undertaken for 35-005[a] also pertain to 35-006.) In 1989, following verbal approval of a closure plan by the New Mexico Environment Department (NMED), the contents of both impoundments, the concrete liners, and contaminated soils were removed, and the excavated pits were backfilled. However, post-closure verification samples collected in 1990 revealed that above-background concentrations of total petroleum hydrocarbons (TPH) were present in surface samples at SWMU No. 35-005(a), and above-background concentrations of volatile organic compounds (VOCs), TPH, and alpha activity were present in the subsurface at SWMU No. 35-005(b). In January 1992, final closure reports for these sites were submitted to EPA and NMED. These sites are currently awaiting resolution of an NMED notice of deficiency (NOD) regarding sampling sufficiency.	1991 LANL IWP (LANL 1991, 0553); Fresquez 1990, 04-0074; Fresquez 1991, 04-0076; Fresquez 1991, 04-0081.
35-007 Waste Oil Treatment System	•	•			SWMU No. 35-007 is a closed-loop system used for reprocessing nonpolychlorinated biphenyl (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, SWMU No. 35-011(c), are also located inside this bermed area. NFA is recommended at this site because the materials managed are not hazardous wastes, and because site design prohibits the migration of spilled oil from the site to the environment.	1990 SWMU report (LANL 1990, 0145); Roberson 1991, 04-0226.

* Designated as an HSWA Module SWMU (LANL 1990, 0145)

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SWMU No. and Type	NFA Criteria A	B	C	D	Description/Justification	References
35-009			•		SWMU 55-009 is a monitoring sump located inside the security fence at TA-55 northeast of the Utility building, TA-55-6. The sump was used to monitor sanitary waste liquids produced at TA-55 for radionuclides before discharge to the TA-35 sewage treatment lagoons. Significant levels of radionuclides were never detected, but the waste liquids may have contained small quantities of chemicals and solvents. The concrete pit measures 7 x 7 ft and is 5 ft 5 in deep and is connected to the Plutonium Building by a 250 ft, 6 in diameter, vitrified clay pipe. The pit is entirely lined with concrete and covered with a metal top. The sump connects to the treatment lagoons by 4000 ft of 8 in vitrified clay pipe. Floor drains from TA-55 no longer drain into the sanitary sewer, the sump is an active part of the sanitary disposal systems from TA-55. Because radionuclides were never detected by the monitoring sump during several years of use, the sump is no longer monitored. The sump is recommended for NFA because it is part of the sanitary sewer at TA-55.	LANL 1990, 0145
35-011(a) Underground Storage Tanks		•			SWMU No. 35-011(a) consists of two active aboveground fiberglass tanks located in the basement of building TA-35-2 (see Section 3.3.2.1). The tanks receive potentially contaminated wastewater. The tanks and surrounding floor were inspected in August 1991, and no evidence of spills was observed. If a spill did occur, the wastewater would flow into floor drains that are tied in to the sanitary waste lagoons east of TA-35 (SWMU No. 35-010). NFA is recommended for this site because a direct release from this site to the environment is precluded by containment within the basement or by diversion through floor drains to the sanitary waste lagoons.	1990 SWMU report (LANL 1990, 0145); Roberson 1991, 04-0228.
35-011(b) Underground Storage Tank				•	SWMU No. 35-011(b) consists of an inactive underground storage tank (UST) (TA-35-159) that formerly stored contaminated waste dielectric oil, which may have contained PCBs and possibly other COCs (see Section 3.3.2.1). Further investigation showed the UST has been emptied and abandoned in place, and the ground above the tank has been covered with concrete; therefore, there is currently little potential for off-site migration of COCs. The site is scheduled to be investigated and remediated in accordance with NMED UST regulations. No further investigation is recommended as part of the OU 1129 RFI because the Laboratory must close the site to comply with state UST regulations.	Umphres pers. comm. in Roberson 1991, 04-0226. McInroy 1992, 04-0255.
35-011(c) Underground Storage Tank		•		•	SWMU No. 35-011(c) consists of an active UST (TA-35-197) and an associated aboveground tank. These tanks are associated with the oil-reprocessing facility, SWMU No. 35-007 (see Section 3.3.2.1). Currently, this system handles only non-PCB dielectric oil, but the tanks may have received oils contaminated with water in the past. The aboveground tank is located within a bermed area that precludes migration of COCs 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. NFA is recommended for this site because leakage from the UST is not suspected, and because potential releases from the aboveground tank are prevented by site design from reaching the environment.	1990 SWMU report (LANL 1990, 0145); International Technology Corporation 1991, 0648.

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SWMU No. and Type	NFA Criteria A	B	C	D	Description/Justification	References
35-011(d) Underground Storage Tanks				•	SWMU No. 35-011(d) includes two USTs that were formerly used for storage of 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 essentially saturated with oil, because of leakage from an aboveground oil-handling facility formerly located at the area. This spill area is designated as SWMU No. 35-014(f). NFA is recommended for the USTs because they have been removed and it was 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, 04-0215. McInroy 1991, 04-0219.
35-012(a) Inactive Storage Tank				•	SWMU No. 35-012(a) consists of one UST (TA-35-158) that received dielectric oils, solvents, etc. from spills that occurred inside TA-35-85 (see Section 3.3.2.1). The tank was leak-tested before removal, and no leaks were found. The tank was removed in 1990 as an RCRA interim status closure and the pit was backfilled and covered with asphalt. NFA is recommended for this SWMU because remediation is complete, and the results of confirmatory sampling were submitted to EPA and NMED in the final closure report (estimated date of submittal was December 1, 1991).	McInroy 1991, 04-0219.
35-012(b) Inactive Storage Tanks	•				SWMU No. 35-012(b) consists of two aboveground siege tanks (TA-35-278 and -279) located near the canyon edge southwest of TA-35-207. The tanks were installed, but were reportedly never used. The site is recommended for NFA because the tanks were never used for management of hazardous constituents.	Umphres pers. comm. in Roberson 1991, 04-0226.
35-013(a) 35-013(b) 35-013(c) 35-013(d) Sumps and Drains	•	• • • •			SWMUs No. 35-013(a through d) consist of several sumps, drains, and catch basins that are all located within buildings (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) reportedly have never been used, and one pair of floor drains included in SWMU No. 35-013(d) have never been used. Potential contamination cannot be adequately addressed without removal of the floors, and there is no potential for this contamination to migrate further to the environment. Any contamination beneath the buildings is considered to be under institutional control until the buildings undergo D&D. NFA is recommended for these sites because site design precludes the migration of COCs to the environment.	1990 SWMU report (LANL 1990, 0145); Umphres pers. comm. in Roberson 1991, 04-0226.
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 buildings TA-35-85 and TA-35-222. The site has since been covered with concrete and new construction (see Section 3.3.2.1). Since the concrete acts as a cap, there is essentially no mechanism for physical transport of potentially hazardous materials from the site. Contamination can be considered to be under institutional control until the buildings and concrete undergo D&D. NFA is recommended because site conditions and institutional controls preclude any releases that might pose a threat to human health or the environment.	1990 SWMU report (LANL 1990, 0145); Roberson 1991, 04-0226.

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SWMU No. and Type	NFA Criteria A	B	C	D	Description/Justification	References
35-014(c) Operational Releases	•	•			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-35-20. This stained area is probably the result of past dielectric oil spills from nearby aboveground tanks that were labeled as PCB-free located southwest of building TA-35-29. These tanks were associated with the decommissioned oil treatment facility identified as SWMU Nos. 35-015(b) and 35-014(d) which will be investigated in Aggregate I. This area is downslope from Aggregate T, SWMU No. 35-018(a), where leaking transformers containing PCBs were reported. Oil stained soil occurs at the entry point of a culvert that drains this area, and also at the point at which the culvert ends near the southeast corner of TA-35-29. In 1992, the area of 35-014(c) was excavated, and refilled for work performed in the southeastern corner of TA-35-29, and covered with asphalt. If COCs are detected in significant quantities in Aggregate I or T, they may effect this area, but on its own account, this area is recommended for NFA on the basis that this area has not been used for the management of RCRA hazardous wastes, and that the migration pathways of the site are minimized by the asphalt capping the area.	LANL 1990, 0145
35-017 Potential Soil Contamination		•		•	SWMU No. 35-017 consists of potential soil contamination from the operations of the LAPRE I, LAPRE II, and LAMPRE reactors. LAPRE I and LAMPRE were operated in Cell J (Room 203) in the basement of building 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, and 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 evidence of releases or spills outside of the reactor cell (Cell J). All areas, except Cell J, associated with the operations of LAPRE I and LAMPRE have been released for unrestricted use; Cell J is considered to be under institutional control. LAPRE II underwent D&D in 1991, was released for unrestricted use in January 1992, and 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, the Environmental Protection Group (EM-8) did confirmatory soil sampling. Results indicate that no areas of concern exist. NFA is recommended for this site.	H-Division 1957, 0474; Peterson 1959, 04-0240; Harper and Garde 1981, 0467; LANL 1990, 0145; Montoya 1993, 04-0294.
35-018(a) Leakage from PCB Transformers		•			SWMU No. 35-018(a) is the location of two transformers containing PCBs that were reportedly leaking dielectric oil during a transformer assessment survey in 1985. One transformer, with ID No. 5024 (identified as SWMU 35-018(a)) was located at substation TA-35-29. The transformer was dripping onto a porous concrete pad with no spill containment and no drip pan and was put on a daily transformer inspection list (Atencio, 1985, 04-0021). The extent of release to the underlying pad and surrounding soil is unknown. The transformer at TA-35-32 was observed during a site inspection in August 1991 and no evidence of past or present leakage was observed (Robertson 1991, 04-0228). These transformers are scheduled to be removed in 1992. Samples will be collected of the soil beneath the transformers.	

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SWMU No. and Type	NFA Criteria A	B	C	D	Description/Justification	References
35-018(b) Leaking PCB Transformer		•			SWMU No. 35-018(b) is a transformer (ID No. 5547) located in the basement of TA-35-2. A leak from this 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 vicinity of the transformer after the spill cleanup contained up to 164-µg/199 cm^2 PCBs . This transformer is believed to have had no releases to the environment. This area is recommended for NFA on the basis that there are no pathways to the environment and that the area is institutionally controlled.	Atencio 1985, 04-0021
42-004 (C-42-001) Canyon Disposal				•	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 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 regulatory level in 40 CFR 261.24, Table 1. NFA is recommended for this site because the site has been characterized and it has been determined that COCs are not present in concentrations that might pose a risk to human health or the environment.	Fresquez 1991, 04-0075.
48-002(d) Container Storage Area		•			SWMU No. 48-002(d) is an active container storage area located inside building TA-48-1 and 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. NFA is recommended because site conditions preclude migration of COCs from the site to the environment.	1990 SWMU report (LANL 1990, 0145); Roberson 1991, 04-0175.
48-002(d) Container storage area		•			SWMU No. 48-002(d) is a storage area on the northwest side of TA-48-1. Containers stored here may contain radioactive waste from the TA 48 hot cell. This active receiving/ shipping area is within the security fence, and is within a building that can be closed off from the environment. Spills or releases have not been documented at this site. This area is recommended for NFA on the basis that the area is institutionally controlled.	LANL 1990, 0145.
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 within building 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 there is no physical evidence of releases or external contamination. NFA is recommended for these sites because site design and conditions preclude migration of COCs from the site to the environment.	1990 SWMU report (LANL 1990, 0145).
48-004(d) Sumps and Tanks	•	•			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). NFA is recommended for this site because the site was never used, and because site design and conditions preclude migration of COCs from the site to the environment.	1990 SWMU report (LANL 1990, 0145); Roberson 1991, 04-0175.

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SWMU No. and Type	NFA Criteria A	B	C	D	Description/Justification	References
48-006 Active Septic System	•				SWMU No. 48-006, an active septic system, was installed in the early 1980s and has only served office buildings in which hazardous or radioactive materials have never been managed (see Section 3.5.2.1). NFA is recommended for this site because there is no contaminant source term and there is no reason to suspect releases of COCs from this septic system.	1990 SWMU report (LANL 1990, 0145)
48-007e drain and outfall	•				SWMU 48-007(e) was submitted to the EPA in May 1985 for inclusion under the NPDES permit, but was dropped from the permit in 1991. The outfall discharged a maximum of 500 gal/hr as noncontact cooling water used to cool an electromagnet in the northwest corner of TA-48-8, the isotope separation building (LANL 1990, 0145). The outfall has been used since 1984. The water discharged in the outfall was used for once-through cooling, and there has not been access for chemicals or solvents to enter 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 that all TCLP metals were below guidelines of 40 CFR 261.24. No SVOCs or PCB compounds were detected, but trace amounts (< 52 ppb) were found of p-isopropyltoluene (p-Cymene), isopropylbenezene (cumene), and tricholrotrifluroethane (Freon) were detected in the samples collected. Since this SWMU has not been used for the management of hazardous materials, which has been verified through sampling, this SWMU is recommended for NFA.	LANL 1991, 04-0261; Chamberlin 1991, 04-0275; Fresquez 1991, 04-0078 ; Fresquez 1991, 04-0079.
48-008 Leakage from PCB Transformers	•	•			SWMU No. 48-008 consists of two PCB transformers that are located inside the basement of building 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. NFA is recommended for this site because a potential release to the environment is precluded by site design and conditions, and because the leakage represents a nonsystematic release that was immediately cleaned up.	1990 SWMU report (LANL 1990, 0145), Helmick pers. comm in Roberson 1991, 04-0175.
48-009 Soil contamination from air-compressor	•				SWMU 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 in the area. The oil was sampled in 1989, and does not contain PCBs. This SWMU is recommended for NFA on the basis that it has never been used for the management of RCRA hazardous or radioactive wastes.	LANL 1990, 0145.

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SWMU No. and Type	NFA Criteria A	B	C	D	Description/Justification	References
C-52-001 C-52-002		•			Areas of concern C-52-001 and C-52-002 are sites of possible soil contamination from Substation TA-52-9, located on the north side of the UHTREX building TA-52-1. Dielectric oil stains have been observed on a transformer pad in the past, and the transformers present at the site in June of 1992 are labeled as containing PCBs. These transformers are situated on a concrete pad and the area around the pad is asphalt. There are no stains or evidence of leakage from the transformers at present. These transformers are scheduled for removal and destruction during 1992, and samples of PCBs will be collected from the soils beneath the transformers.	LANL 1990, 0145.
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 Ultra-High-Temperature Reactor Experiment (UHTREX) reactor (see Section 3.6.2.1). These sites underwent D&D in 1989 and were decontaminated to levels below Department of Energy (DOE) guidelines for radioactivity. There was no process-related source for nonradioactive hazardous constituents at these particular sites, and therefore no hazardous contaminant source term. NFA is recommended because the sites have undergone remediation and COCs are not present at levels that pose a risk to human health or the environment.	Salazar and Elder 1991, 0623; Elder 1991, 04-0218.
52-001(d)* Sump Pump Room, Hot Cells, Duct Work		•		•	SWMU No. 52-001(d) consists of contaminated equipment inside building 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 that do not exceed DOE guidelines for radioactivity. NFA is recommended for this SWMU because the sites have undergone remediation and COCs are not present at levels that might pose a risk to human health or the environment. In addition, site conditions preclude a release of COCs from inside the building to the environment.	Salazar and Elder 1991, 0623.
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 only served office buildings in which hazardous or radioactive materials have never been managed (see Section 3.6.2.1). NFA is recommended because there is no contaminant source term and no reason to suspect releases of COCs from these septic systems.	1990 SWMU report (LANL 1990, 0145); Smithour 1991, 04-0222.
52-002(c)* 52-002(d)* Active Septic Systems	• •				SWMU Nos. 52-002(c and d) represent septic systems that were apparently planned but were never constructed (see Section 3.6.2.1); NFA is recommended because the sites do not exist and have never been used for the management of hazardous or radioactive materials.	Smithour 1991, 04-0222.
52-002(g)* Active Septic System	•				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. NFA is recommended because the site has never been used in the management of hazardous or radioactive materials.	Smithour 1991, 04-0222.

* Designated as an HSWA Module SWMU (LANL 1990, 0145).

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SWMU No. and Type	NFA Criteria A	B	C	D	Description/Justification	References
52-003(b) Industrial Waste **Lines**				•	**SWMU No. 52-003(b) consisted of two 3-in. cast-iron industrial waste lines 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). Lines 65 and 66 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 lines. Sample depths ranged from 5 ft to 7 ft. Beta activity was nondetectable, alpha and gamma activity were far below the site-specific RESRAD model. All metals were within background levels. Organics were below detection. The site is recommended for NFA on the basis that the site has undergone D&D and confirmatory sampling indicates that COCs are not present in concentrations that exceed natural background levels.**	**Soholt 1988, 04-0189; Salazar and Elder 1991, 0623; Elder 1991, 04-0218.**
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 radiation survey conducted in the area of the outfall during a 1988 ER Program site reconnaissance did not exceed background levels. NFA is recommended because the site was never used for the management of hazardous or radioactive materials.	DOE 1987, 0264; Roberson 1991, 04-0229.
55-001 Cementing Process 55-004 **Evaporator** 55-005 **Filtration Unit**		• • •			SWMU Nos. 55-001, 55-004, and 55-005 consist of a cementing process, an evaporator, and a filtration unit, which are situated together inside a series of negative pressure gloveboxes inside the Plutonium Building, TA-55-4 (see Section 3.7.2.1). All are part of the TA-55 waste minimization process that operates under RCRA Mixed Waste Interim Status. NFA is recommended because a release of hazardous materials to the environment from these SWMUs is precluded by site design, and because all are part of a process permitted under RCRA Mixed-Waste Interim Status at the Laboratory.	1990 SWMU report (LANL 1990, 0145); Foxx pers. comm. in Roberson 1991, 04-0211.
55-002(a) **55-002(b)** Radioactive **Waste Container Storage Areas**		• •			SWMU Nos. 55-002(a and b) are container storage areas for radioactive solid waste (see Section 3.7.2.1). SWMU No. 55-002(a) consists of several separate storage areas located inside building TA-55-4; and SWMU No. 55-002(b) includes dempster dumpsters outside of TA-55-4 that are only used for temporary storage of radioactively contaminated solid waste. NFA is recommended for these sites because site design and conditions preclude a release of COCs to the environment.	1990 SWMU report (LANL 1990, 0145); Foxx pers. comm. in Roberson 1991, 04-0211.

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SWMU No. and Type	NFA Criteria A	B	C	D	Description/Justification	References
55-003 Containment Area	•	•			SWMU No. 55-003 consists of an aboveground storage tank and the surrounding containment structure (see Section 3.7.2.1). The tank is currently used for storage of pure nitric acid, which is product, not 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. NFA is recommended because the tank is not used for storage of hazardous waste, and because a release to the environment is precluded by site design.	1990 SWMU report (LANL 1990, 0145); Foxx pers. comm. in Roberson 1991, 04-0211.
55-006 Glass Breaker		•			SWMU 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 glovebox inside building TA-55-4. NFA is recommended because a release to the environment is prohibited by site design.	1990 SWMU report (LANL 1990, 0145); Foxx pers. comm. in Kaal 1991, 04-0105.
55-007 Thermal Combustion Units		•			SWMU No. 55-007 consists of two currently inactive thermal combustion units that are located in gloveboxes inside 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 (HEPA) filters. NFA is recommended because releases of hazardous materials to the environment are restricted by site design, and because the units will not be operational until appropriate RCRA permits are obtained.	Foxx pers. comm. in Roberson 1991, 04-0211.
55-008 Sumps and Tanks		•			SWMU No. 55-008 consists of several sumps and tanks that are located in the basement of building 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 removal of the floors, and there is no potential 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. NFA is recommended for this site because even if primary releases from the sumps and tanks occurred, site design would prohibit the migration of COCs to the environment.	1990 SWMU report (LANL 1990, 0145); Foxx pers. comm. in Roberson 1991, 04-0211.

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SWMU No. and Type	NFA Criteria A	B	C	D	Description/Justification	References
55-009 Sump	•				SWMU No. 55-009 is an inactive monitoring sump located outside of TA-55-4 (see Section 3.7.2.1). The sump was used to monitor sanitary waste liquids from TA-55 for radioactivity before discharge 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. NFA is recommended because hazardous wastes were not generated, treated, stored, or disposed of at the site, and radioactivity was never detected in the waste stream with the monitoring sump.	Foxx pers. comm. in Roberson 1991, 04-0211.
55-010 Solvent spill		•			A solvent spill containing a large quantity of methyl ethyl ketone, with toluene and methyl isobutyl ketone in smaller quantities has been found at a depth of 18 ft beneath the surface at the southwestern side of the Plutonium building (TA-55-4). The chemicals were located 6-8 ft from the basement wall of Rm 401. Samples were found to contain plasite paint; an organic solvent based epoxy paint. The contaminated soil was covered with additional clean soil and asphalt in 1978. The asphalt cap minimizes water infiltration and therefore, spill migration. This area is recommended for NFA because this spill was a one-time event and site design precludes a releases from this SWMU that would pose a threat to human health or the environment.	LANL 1990, -145, Schmidt 1984, 04-0182; Roy F. Weston, Inc. 1989, 0486.
55-012 Inactive Hazardous Waste Container Storage Area		•			SWMU No. 55-012 consisted of a bottle that contained waste acid and heavy metals that was stored on a shelf in a laboratory inside building TA-55-4 (see Section 3.7.2.1). NFA is recommended because the bottle was removed and the contents disposed of before a site visit in November 1990, and because even if a release had occurred, site design would have precluded a release to the environment.	1990 SWMU report (LANL 1990, 0145).
55-013(a) **55-013(b)** Hazardous Waste Container Storage Areas		• •			SWMU 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 (i.e., product, not waste materials) are located under fume hoods. The storage areas are located within building TA-35-3 and -4. NFA is recommended because site design and conditions preclude a release that might pose a threat to human health or the environment.	1990 SWMU report (LANL 1990, 0145); Foxx pers. comm. in Roberson 1991, 04-0211.

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 to make better use of sampling personnel and equipment and to shorten the overall RFI 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 Figure 2-6 for SWMU locations.

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 (see Chapter 1.0 for a discussion of Module SWMUs) at OU 1129. All SWMUs listed in the 1990 SWMU report have not been addressed in this chapter; those that have not been addressed here will be submitted as an addendum to the SAPs at a later date. Table 7-1 lists those HSWA Module SWMUs and non-HSWA Module SWMUs 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 7.20, which present Phase I SAPs for SWMU Aggregates A through P at OU 1129.

7.1 Modeling in OU 1129 Sampling Plan Development

A large number of SWMUs and areas of concern (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 general sampling plan development.

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

1) Developed 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) Helped 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.

TABLE 7-1

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

SAP Subsection	SWMU Aggregate	SWMUs Within Aggregate
7.5	A	4-001 and 4-002
7.6	B	5-001(a,b) and 5-002
7.7	C	5-004 and 5-005(a)
7.8	D	35-003(a-h, l-o, q-r, and misc.)
7.9	E	35-008
7.10	F	35-009(a-d)
7.11	G	35-010(a-e)
7.12	H	35-014(a, b)
7.13	I	35-003(j,k), 35-014(d), 35-015(a)*, and 35-015(b)
7.14	J	42-001(a-c)*, 42-002(a-b)*, and 42-003*
7.15	K	48-001
7.16	L	48-002(a,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,b)

* This SWMU is not listed on the HSWA Module.

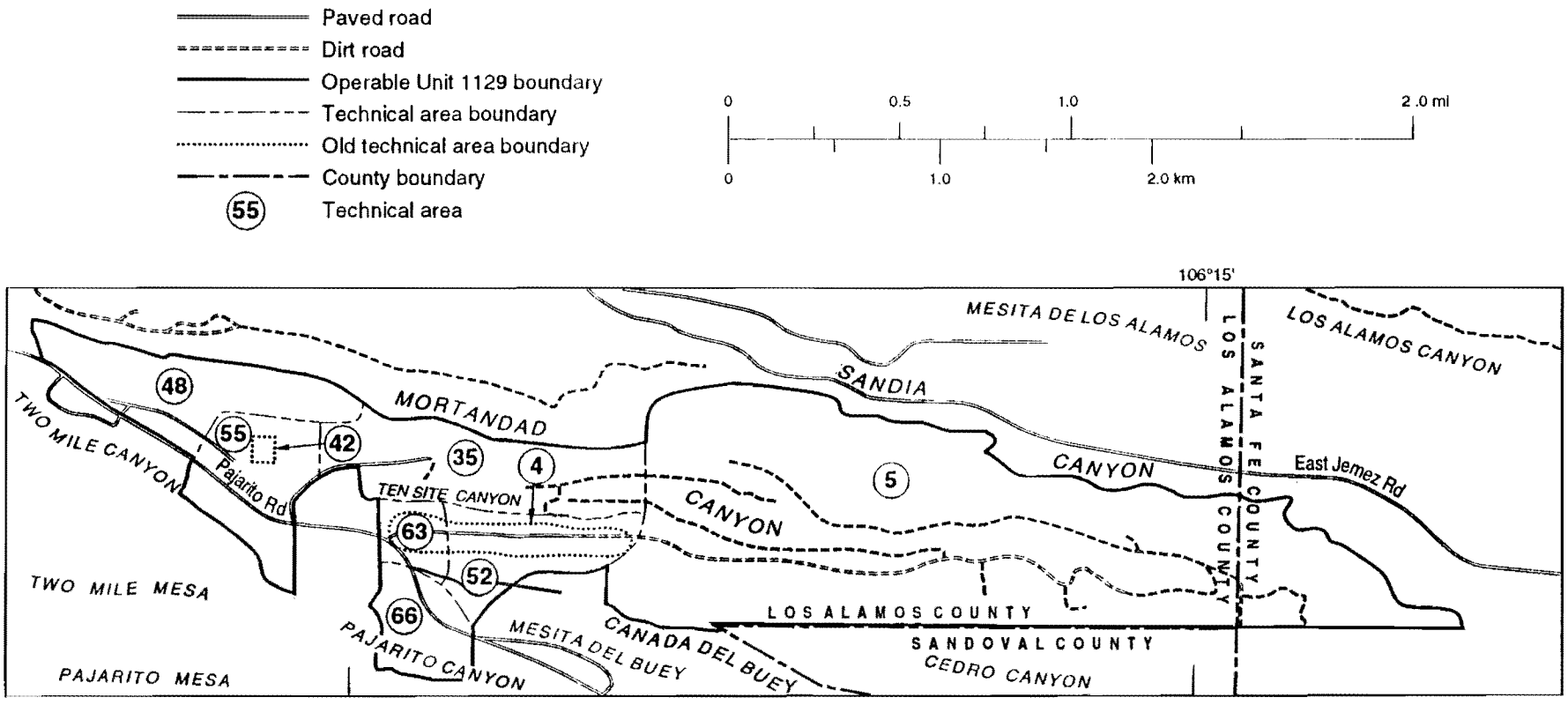


Figure 7-1. Location of technical areas at OU 1129.

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

4) Provided 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 involving direct discharge of liquid effluent or chemicals to the soil were created. 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 of OU 1129's principal aquifer is several hundred meters, a model for examining the vadose zone was chosen for ground-level liquid effluent. The Environmental Protection Agency (EPA)-sponsored PC Graphical Exposure Modeling System (PCGEMS) (General Sciences Corporation 1990, 04-0264) 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, 04-0264). 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 code was used. This code calculates airborne concentrations of radionuclides from constant point sources. 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 code, SURFER, which was used to krige the results to produce an isoplethic map of the depositional pattern. No specific transport within the vadose zone of the radionuclides deposited was estimated.

An effort was also made to help focus the sampling plans for some areas by modeling the predicted zones of highest concentration on the basis of evaluation of data from previous sampling events associated with the removal of contaminated facilities. Data from these activities were used with the SURFER code to prepare isoplethic maps of contaminants in the area just east of TSL-7 in TA-35. The results of this effort are shown in the sampling plan for Aggregate D, SWMU Nos. 35-003(a-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 modeled 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 (Resource Conservation and Recovery Act [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 as roughly analogous to other DNAPLs likely to be encountered, including 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, 0161). (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, 04-0265) and Travis and Nuttall (Travis and Nuttall 1985, 04-0266). For all three scenarios, the local climatological summary contained in the 1989 environmental surveillance report (Environmental Protection Group 1990, 0497) 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 on a more or less continuous basis 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, run-off, 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 over a 25 m^2 area as a one-time incident on the Hackroy soil type on the TA-35 mesa top. The soil column consisted of three layers. The top two layers were comprised of 8 cm of a sandy loam above 22 cm of a clay loam, all underlain by the Bandelier Tuff. Figure 7-2 shows that the SESOIL model predicted that a maximum pollutant depth of about 3.3 m would occur after a dozen years.

In contrast, Scenario 2 involved a DNAPL and 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

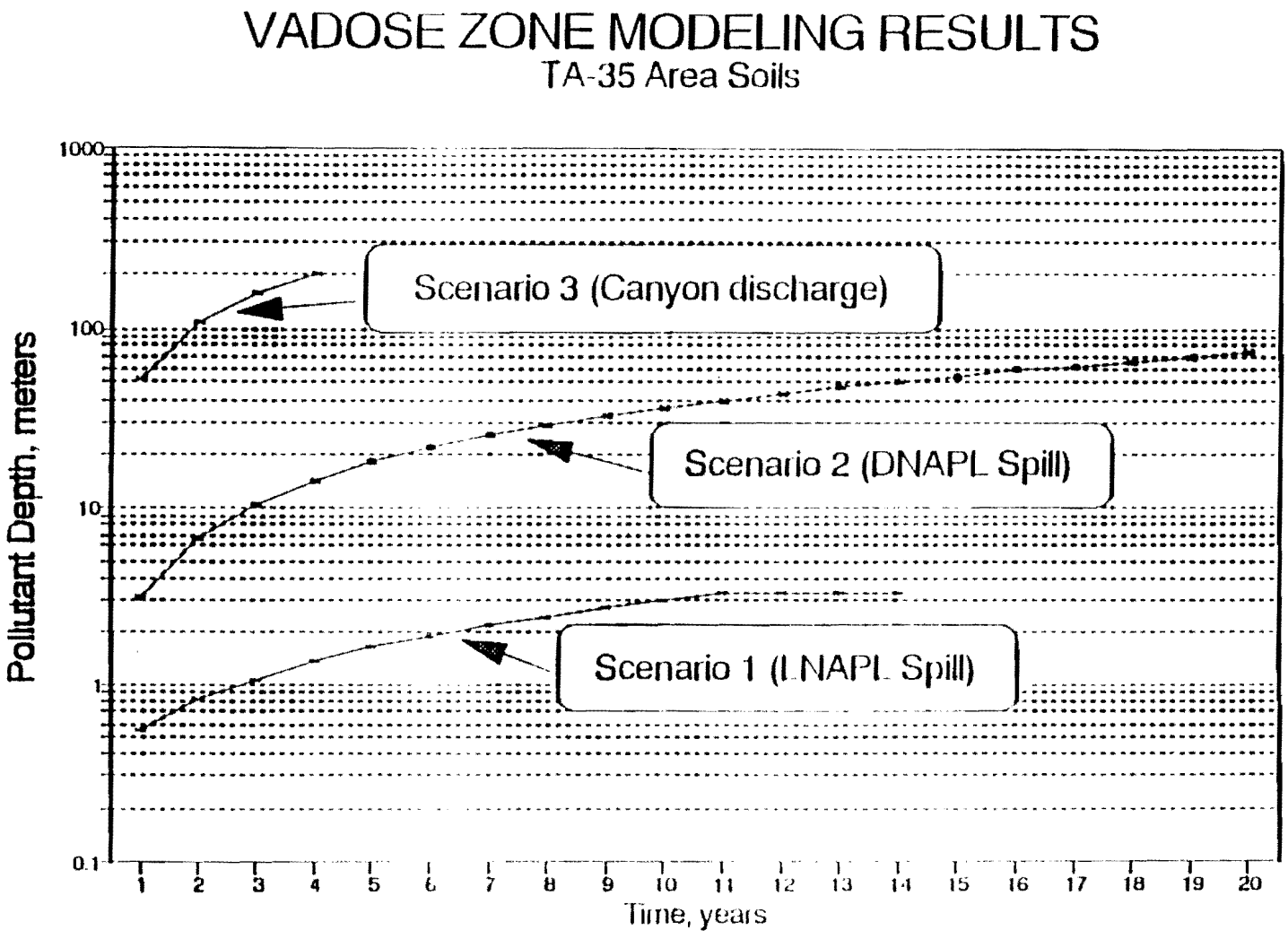


Figure 7-2. Vadose Modeling Results

the expected results for these two compounds given the increased mass and aqueous solubility of the DNAPL.

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

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 over the period 1955 through 1963 were modeled for a 30-year term. Records of the plant's discharges are not complete, but 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 on 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. These investigations, while broader in scope, are necessary to help define the potential migratory conditions for any contaminant plume.

7.1.5 Results of Airborne Radionuclide Emissions Model

The use of 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 offering a greater probability of a find. The FE54 stack (further discussed in Section 7.15) on the northeast corner of 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 from TA-59 was used. It was assumed that most emissions occurred during daytime (regular business hours), so stability classes E and F, which normally occur only at night, were ignored. The AIRDOS output was in terms of air concentration by distance of 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 isoplethic maps were generated (Figures 7-31 and 7-32).

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 NNW trending axis. Based on these results, sampling should occur to the northwest of building 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 could occur in OU 1129 that contain both organic compounds and radionuclides. 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 transport of cations of metals, but some 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, Aggregate D) considers these data in results from the Scenario 3 vadose zone modeling as partial justification for extending sampling to greater depths where this potentially mixed waste stream occurred.

7.2 Radionuclide Deposition Modeling at OU 1129

Two stack effluent release points have been identified at OU1129 as the most significant airborne contributors to local radionuclide soil deposition. One stack, which was identified as the north stack (FE54) at TA-48 (radiochemistry laboratory), has released plutonium, uranium, and mixed fission products. The second stack, which was identified as a stack vented on the south side of building TA-35-2 at TA-3, has released plutonium and tritium. Both facilities have operated from the 1950s until present. TA-35 stack releases are generally less than those from TA-48 but 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 present. Available release data indicate that the earlier releases were considerably larger than more recent times, presumably because of both superior engineered mitigating features and increased regulatory concern. A total of about 512 µCi of plutonium has been discharged out of the stack. Of that, 439 µCi or 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, the ^{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 TA-48 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 the TA-48 north stack. 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 the TA-48 north stack. A total of 19,800 µCi of released fission products were documented from 1974 to present. Additional releases are suspected before 1974. The most significant fission products in the mix includes ^{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 1,000-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 present. Available release data indicate that the earlier releases were considerably larger than more recent releases. A total of about 31 µCi of plutonium have been discharged out the stack. Of that, 27 µCi or 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 were documented only from 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 7,050 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. While 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 for use by 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, 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 particulates' chemistry and size, and of local vegetation. For these calculations, a dry deposition velocity of 0.0018 m/s is assumed for particulates, and a value of 0.035 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 EM-8, the Environmental Protection Group at the Laboratory.

7.2.2 Levels of Local Radionuclide Deposition

Results from the AIRDOS-EPA analysis show a maximum deposition activity located at 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 $6x10^{-5}$ 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 $1.6x10^{-4}$ 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 $5.0x10^{-6}$ pCi/cm^2 ($5.0x10^{-2}$ pCi/m^2) for ^{239}Pu and a cumulative alpha surface concentration of about $1.0x10^{-5}$ pCi/cm^2 ($1.0x10^{-1}$ 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.

Isoplethic 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).

7.3 Three-Dimensional Random Sampling in OU 1129 SAP Development

The goal of Phase I sampling within OU 1129 is to determine the presence or absence of COCs, with those SWMUs containing COCs going on to Phase II sampling, and those not showing any COCs being recommended for NFA. The problem faced was to determine a method that would produce sampling locations and numbers that could be statistically justified.

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), in which N is a function of sample variance and CI is compared to a regulatory threshold value for the sampled pollutant concentration. Unfortunately, no regulatory threshold or action level that make up the bulk of available archival sampling data within the OU, or any other comparison number for radionuclides currently exists. Therefore, this approach to defining sample number adequacy does not suffice at the present time for sites at OU 1129.

7.3.1 Random Sampling Method

Initial site investigations will focus on sampling areas in which known or suspected COCs occur, such 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 OU 1129 SWMUs, a three-dimensional (3-D) random sampling approach to aid in designing the Phase I sampling plans was used. This method is consistent with methods proposed in SW-846 (EPA 1986, 0291) for investigation of large tanks, landfills, and lagoons, in which 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 as a large 3-D block (Figure 7-3). The lateral extent (from archival sampling data, or estimated from archival descriptions or site visits) for a SWMU sets the maximum x and y limits of the block, while the modeling of worst-case transport scenarios for various pollutants sets the maximum z (or vertical extent) 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 elsewhere.) This block can then be further divided into a series of cells or nodes by placing an arbitrary x-y grid on the surface and by assigning z intervals on the basis of sampling tool dimensions.

Thus, if the x-y-z coordinates for sampling are randomly selected, any individual cell has a theoretically equal chance of being sampled, and in the case of the vertical spacing, the chance of missing a pollutant horizon by using fixed interval sampling is reduced. The results from this sampling method may later be evaluated for effectiveness, and the results used for a better Phase II sampling plan or for justification of NFA recommendations. The advantage of this approach is cost effectiveness; a minimum of sampling locations and analyses can produce a statistically valid view of contamination present (or absent) within the block investigated.

7.3.2 Use of Random Sampling in SAP Development

The use of random sampling in designing a sampling plan for Phase I investigation of any SWMU or SWMU aggregate is straightforward and is combined with modeling results, 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, and a set of x and y coordinates somewhat larger than the spill or release area is chosen.

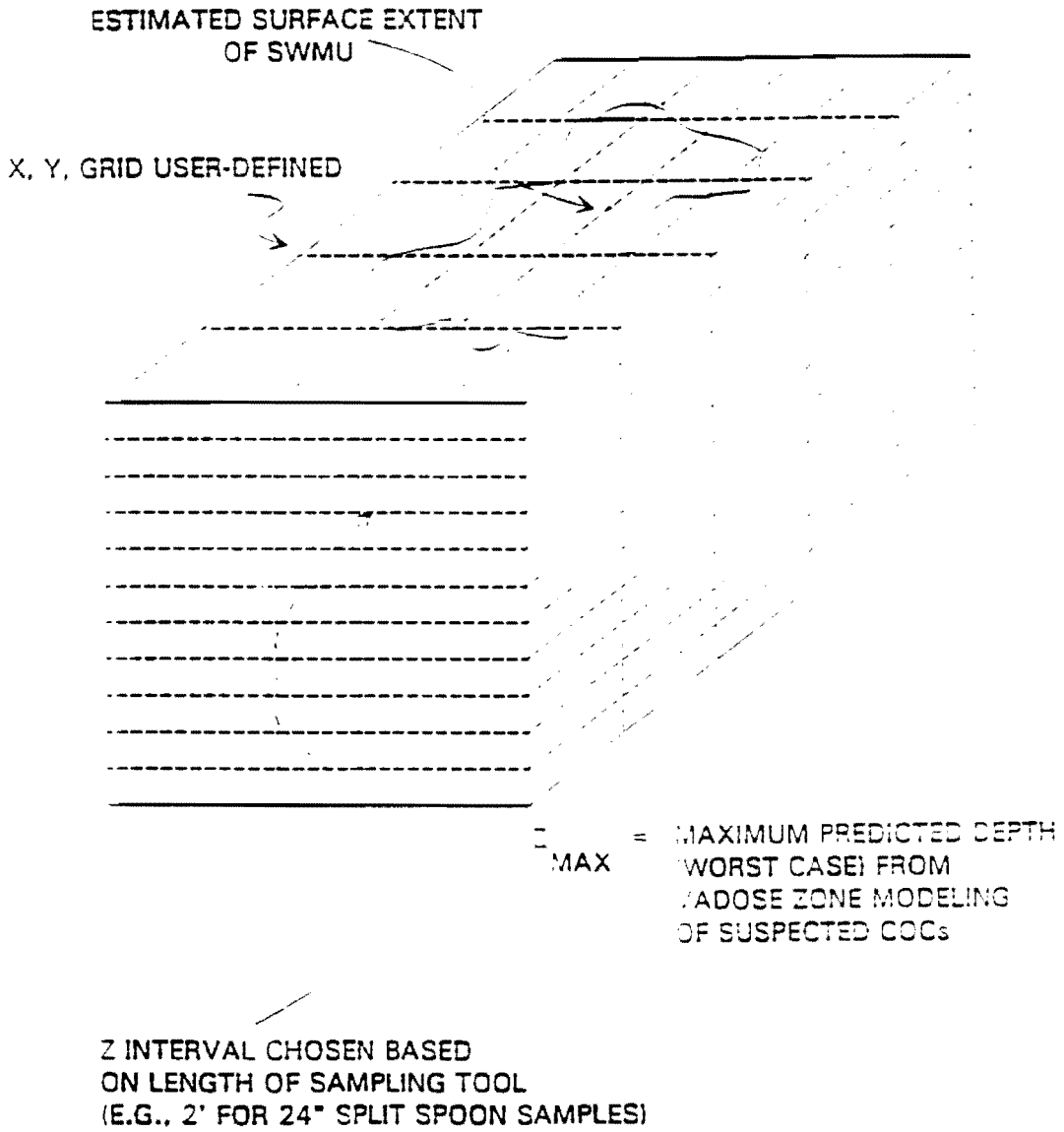


Figure 7-3. 3-D Modeling.

2) The maximum likely vertical extent is estimated from modeling and depends on type of pollutant.

3) A grid of user-defined spacing is overlaid on the site and sampling grid locations and z sampling depths are randomly generated for as many boreholes and sample intervals within the block as the user directs. (In this case, a small compiled BASIC code was written that restricts random number generation to the range of grid nodes or cells within the specified block.)

4) The sampling plan is then written with the randomly selected sampling locations. The choice of analytical suites for any sample location is user determined. 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.

In all cases, the user may choose to also sample at some default depth or location. This depends on knowledge of the SWMU or its COCs and their behavior, or on finding any "hot spots" during screening of continuous core, even though this may not be a randomly selected interval. An example is a site with radionuclides that has at least one sample taken near the surface because the concentration of radionuclides through cationic adsorption to soil clay particles is expected. The plan may also state, for example, that for any site at least one sample will be taken at the maximum z depth predicted by the model. The method is designed to allow flexibility in the sampling approach while maintaining a statistically useful basis.

7.3.3 Samples 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 at which a sample is collected at a specific x and y coordinate. After the FIMAD number is another hyphen followed by a letter that designates the type of sample to be taken. The designators and the sample type they represent are as follows:

- B – borehole
- A – auger
- 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.

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 only show the x and y coordinates.

7.4 Surveys

The SWMUs will be field surveyed before sample collection to characterize each site. 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 at each site.

7.4.1 Engineering Survey

Each SWMU will be surveyed according to procedures documented by Los Alamos National Laboratory (LANL) Facilities Engineering. 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 (NMSP) Coordinate System. This survey data will be incorporated into FIMAD.

7.4.2 Environmental Survey

An environmental survey will be conducted at each SWMU. These are predominately walking surveys using direct reading or recording instruments. The grid pattern established by the engineering surveys will be followed during the walkovers, 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 using a scintillometer 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.

7.5 SWMU Aggregate A, Phase I

SWMU Aggregate A consists of SWMU Nos. 4-001 and 4-002, located on the north side of Puye Road at the eastern edge of former TA-4. Both of these SWMUs are listed in the HSWA Module VIII (EPA 1990,0306) (Table 1-1). SWMU No. 4-001 represents a former firing site and SWMU No. 4-002 is a canyonside disposal area associated with the site. Figure 7-4 depicts the location of the SWMUs.

7.5.1 Sampling Plan Rationale and Objectives

Archival information indicates that the contaminants that may be present at the Technical Area (TA) 4 firing site (SWMU No. 4-001) and the corresponding canyonside disposal site (SWMU No. 4-002) consist of depleted uranium, high explosives (HEs) (because of two D&D activities and weathering, high explosives are not expected to be found), and various metals (Section 3.1). These COCs were released from routine munitions tests conducted at the firing site between 1944 and 1946. During these years, shot debris from the firing site was periodically bulldozed over the mesa to the canyonside disposal site. In August of 1985, during the Los Alamos Site Characterization Program (LASCP) cleanup effort the pit was cleaned of all debris, backfilled, and contoured. No subsurface or surface radioactivity was detected during this cleanup operation (Montoya 1985, 04-0158). A radiation survey conducted in 1988 found two projectiles and a piece of shrapnel that exceeded background for beta/gamma activity (LANL 1988, 04-0126; LANL 1988, 04-0127; Shafer circa 1989, 04-0187). In early 1991, one surface soil sample was collected at the TA-4 firing pit. All metals were below EPA guidelines. Total beryllium and uranium were determined to be at background levels. No tritium or semivolatile organic compounds (SVOCs) were detected (Fresquez 1991, 04-0232). A detailed description of the site activities and history of these SWMUs is found in Section 3.1 of this Work Plan.

The objective of this Phase I sampling plan is to determine the presence or absence of soil contamination at the former firing site and surface disposal site. Sampling activities are biased toward areas in which residual contamination is most likely to be present on the basis of the following conceptual model for a release at this site:

- Previous D&D activities have removed a vast majority of contaminants.
- Any remaining contaminants should be found as point sources.
- Erosion of soils containing point sources is the only likely transport mechanism.

The surface investigation at Aggregate A is designed primarily to answer the following decision points:

1) Does surface soil contamination currently exist in Aggregate A?
2) Where and how extensive are the surface and near-surface artifacts (projectiles, shrapnel, and other potentially contaminated objects), which in the future represent potential contaminant release points?

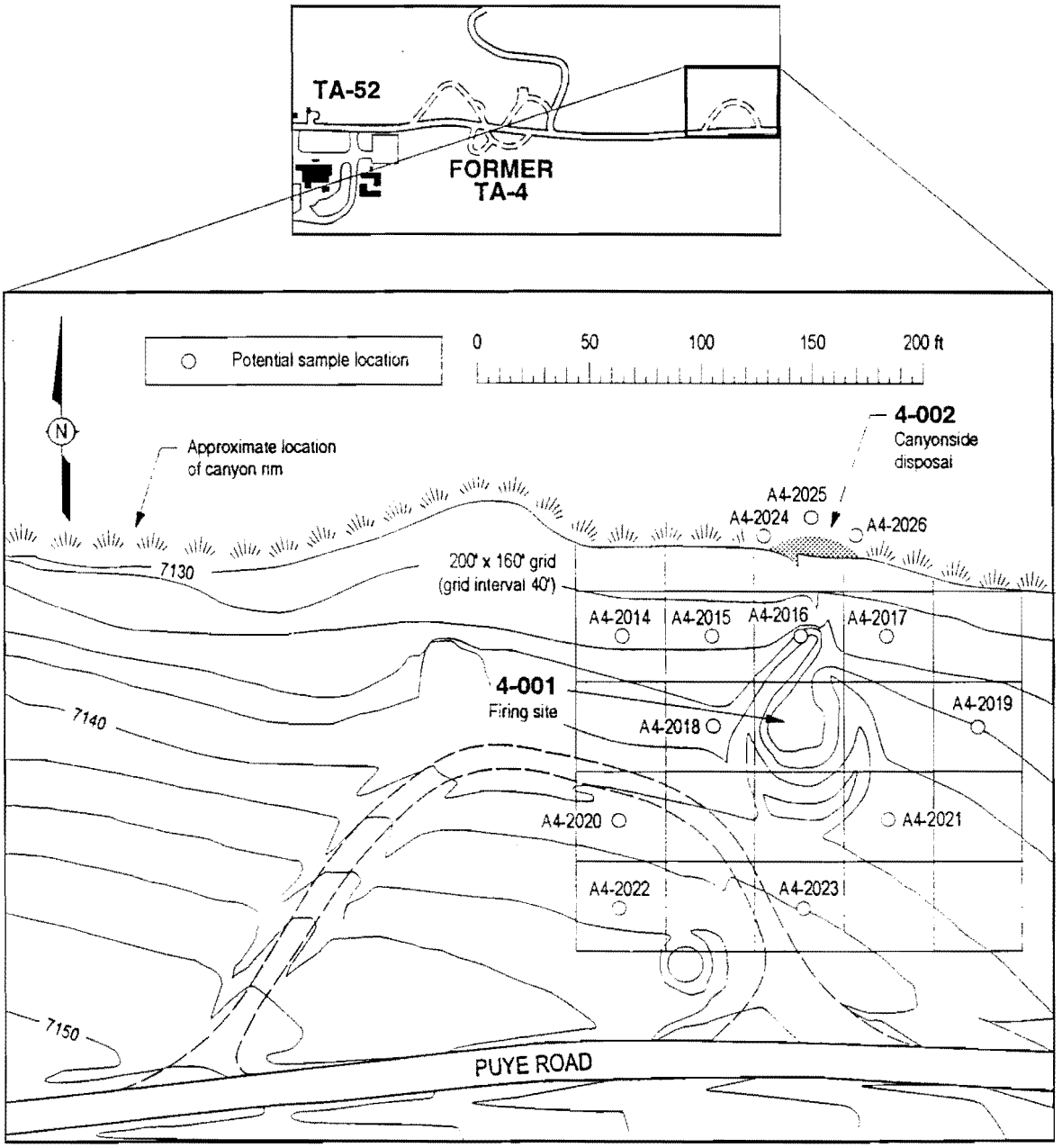


FIG 7-4 / 091493 LASL 1951 (R-70)

Figure 7-4. Schematic sample location map for SWMUs 4-001 and 4-002, Aggregate A.

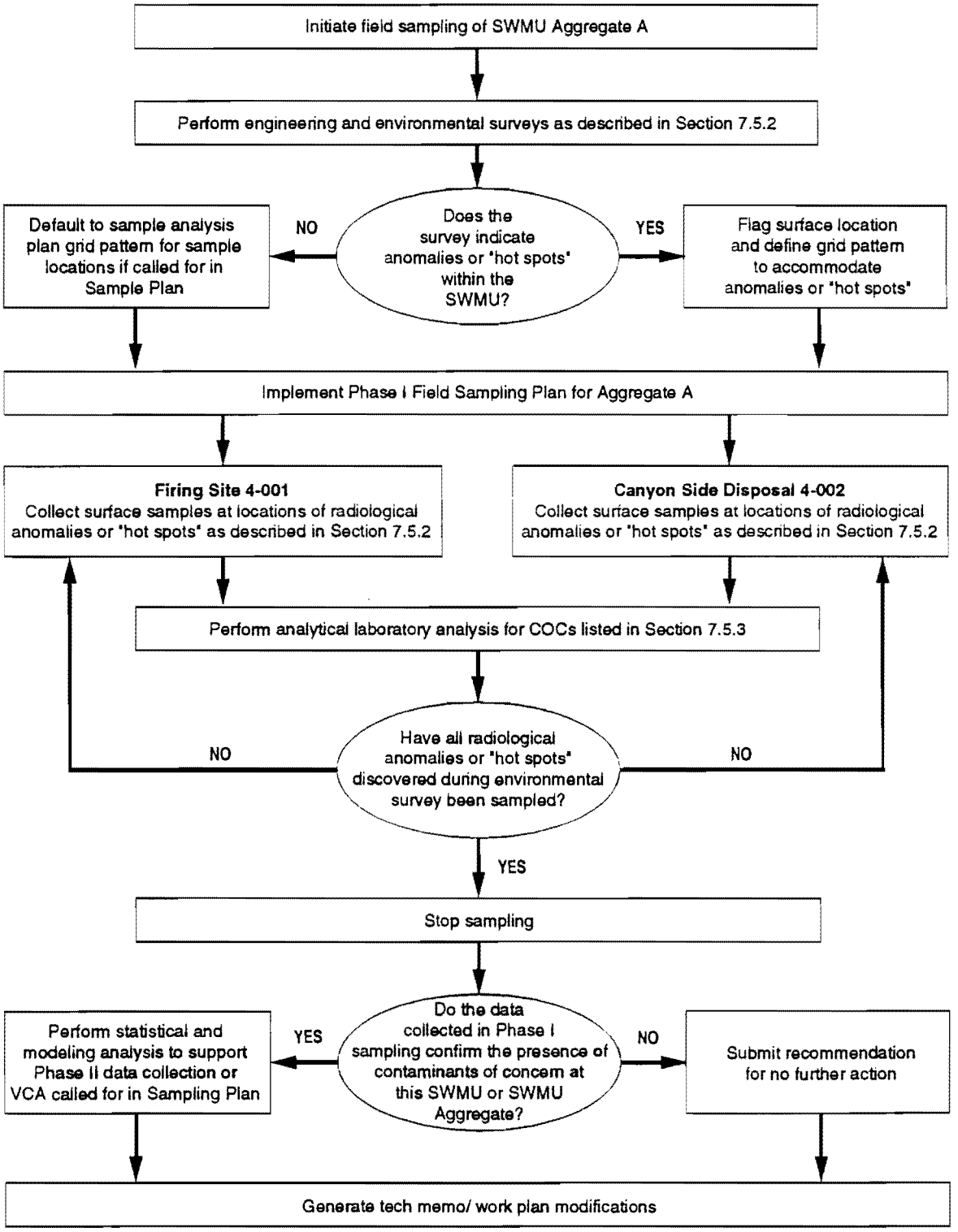


Figure 7-5. Decision logic for the sampling and analysis of SWMU Aggregate A.

3) What is the potential for surface migration of contaminants.

Decision logic for Phase I field investigation activities to be conducted at SWMU Aggregate A is presented in Figure 7.5.

7.5.2 Phase I Field Activities Investigation

The Phase I investigation of Aggregate A consists of the engineering survey and environmental survey. If point sources are identified during these surveys, both voluntary corrective action (VCA) to remove point sources and surface sampling will be implemented.

The surface areas of SWMU Aggregate A will be surveyed for radiological contamination using hand-held or tripod-mounted detectors for field gamma spectroscopy systems. A geophysical survey will cover the same area proposed for the radiological survey. This survey will be conducted to locate artifacts and subsurface features. This investigation primarily addresses questions listed in Section 7.1.1 (Sampling Rationale and Objectives). The area encompassed by the SWMU Aggregate A plus a 25 ft margin and any erosional cuts leading from the disposal site SWMU No. 4-002 will be surveyed.

If hot spots are detected, hand-held detectors will be used to define precisely the hot spot locations and the lateral distributions of contaminants and the hot spot will be sampled. The distribution of spatial contaminants will be determined by collection of one soil sample at a depth of 6 to 12 in. below the hot spot and another sample 3 ft away at the same depth at which the hot spot was located. A VCA will be conducted to remove the hot spot artifact. Soil samples will be **analyzed for metals;** gross-alpha, -beta, -gamma; gamma spectroscopy, and alpha spectroscopy. **If the former firing pits can be located, spot HE sampling will be conducted.**

The canyonside disposal area (SWMU No. 4-002) consists of discarded material that was pushed over the canyon rim. This disposal area is approximately 20 ft wide at the canyon edge and is spread out along the mesa side to the canyon bottom. A small drainage cuts through the disposal area. A radiological and geophysical survey will be conducted using hand-held instruments across the entire disposal area and along the drainage channel. If hot spots are located in the discarded material or in the drainage, they will be characterized. The geophysical data will be used to characterize any buried materials and to choose a discreet sampling method. The surveys will be extended beyond the discarded piles and down the drainage until radioactivity levels are no longer detected.

The radiological survey of Aggregate A will be followed by geophysical survey. This investigation will focus on the following objectives:

- Detect and locate near-surface artifacts and debris at the canyonside disposal site that are potential sources of contamination.
- Provide confirmatory information on the location of the firing site (SWMU No. 4-001).

Any artifacts or debris at or near the surface will be treated as a potential source of contamination. Therefore, when feasible, the recommendation will be made to

remove such near-surface artifacts and debris will be removed as a VCA and screened for contamination. Soil samples will be characterized that are in contact with any contaminated debris or artifacts.

7.5.3 Sample Screening and Analysis

Each soil sample will be screened for radiation using a scintillation detector for contact radiation. All sample packages must be screened for surface contamination and radiation. The soil samples will be analyzed for metals; gross-alpha, -beta, -gamma; gamma spectroscopy; and alpha spectroscopy.

7.6 SWMU Aggregate B, Phase I

SWMU Aggregate B consists of SWMU Nos. 5-001(a and b) and 5-002, located on the north side of Puye Road near the edge of Mortandad Canyon. All of these SWMUs are listed in the HSWA Module VIII (EPA 1990, 0306) (See Table 1-1). SWMU Nos. 5-001(a and b) represent former steel barricade Firing Pits No. 1 and No. 2, and SWMU No. 5-002 is a canyonside disposal area associated with the firing sites. Figure 7-6 depicts the location of the SWMUs. A detailed description of the site activities and history of these SWMUs is found in Section 3.2 of this Work Plan.

7.6.1 Sampling Plan Rationale and Objectives

LASCP D&D activities at TA-5 were conducted in 1985. During the LASCP site cleanup, depleted and/or natural uranium was detected as discrete spots of yellow uranium oxide. Uranium-contaminated surface soil was removed, monitored for radioactivity levels, and disposed. In areas for which contaminated soils were removed, remaining native soils were sampled to ensure that all above background radioactivity was removed (Scholl 1989, 0485). Most of the contamination at TA-5 was detected within the top 2 ft of soil. A sample of the uranium collected on site was analyzed to determine the type of uranium found at TA-5. The sample was determined to be depleted uranium.

Test shots probably dispersed contaminants in some form of a radial pattern around the firing site, and because of this dispersive release mechanism, concentrations of COCs are expected to be very low and primarily limited to near-surface soils. Contamination has been detected to a depth of 15 ft at a firing pit at TA-5. Contamination found at such depth probably occurred because multiple shots in the same area loosened the tuff and created fractures. Soil samples were collected and monitored for radioactivity at varying depths in the pit and the pit bottom. When decontamination of the area was completed, the pit was backfilled with clean soil from TA-5-1, TA-5-2, and TA-5-3 (Montoya 1985, 04-0158; Scholl 1989, 0485). While very small amounts of contaminants may remain as isolated point sources at the surface and at depths, no viable pathway to the environment can be determined within current land use scenarios.

The objective of this Phase I sampling plan is to determine the presence or absence of soil contamination at the former firing site and surface disposal site. Sampling activities are biased toward areas in which residual contamination is most likely to be present on the basis of the following conceptual model for a release at this site:

- Previous D&D activities have removed vast majority of contaminants.
- Any remaining contaminants should be found as point sources.
- Erosion of soils containing point sources is the only likely transport mechanism.

The surface investigation at Aggregate B is designed primarily to answer the following questions:

1) Does surface soil contamination currently exist in Aggregate B?

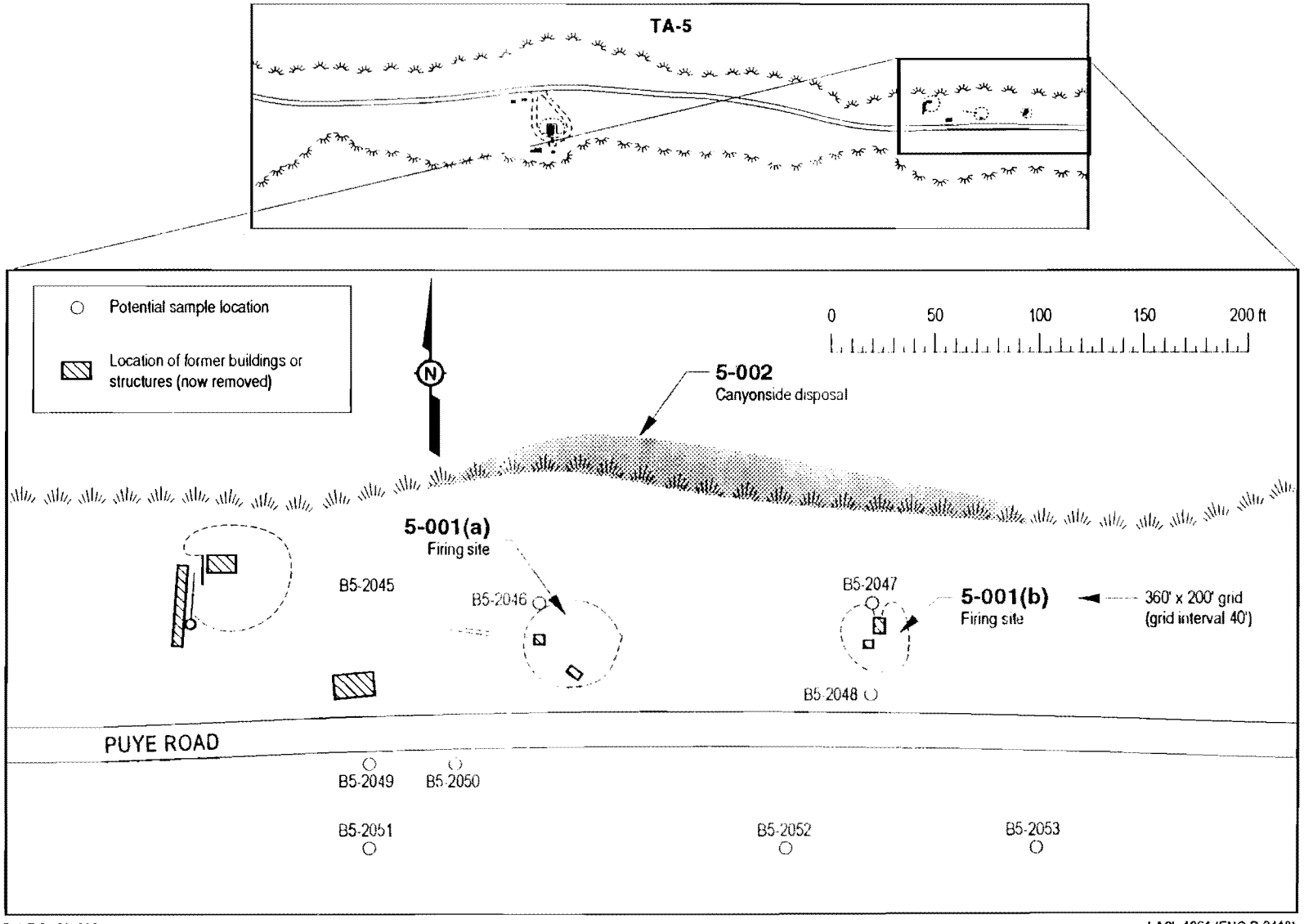


FIG 7-6 / 091393

LASL 1961 (ENG R-2418)

Figure 7-6. Schematic sample location map for SWMU Aggregate B

2) Where and how extensive are the surface and near-surface artifacts (projectiles, shrapnel, and other potentially contaminated objects)?

3) What is the potential for surface migration of contaminants?

Decision logic for Phase I field investigation activities to be conducted at SWMU Aggregate B is presented in Figure 7-7 and is discussed in the following text.

7.6.2 Phase I Field Investigation Activities

After the preliminary engineering survey of the SWMUs is conducted, the surface areas of SWMU Aggregate B will be surveyed for radiological contamination using hand-held or tripod-mounted detectors. A geophysical survey will be conducted to locate artifacts and subsurface features. This investigation primarily addresses questions listed in Section 7.6.1 (Sampling Rationale and Objectives). The area encompassed by the SWMU Aggregate B plus a 25-ft margin and any erosional cuts leading from the disposal site SWMU No. 5-002 will be surveyed.

If hot spots are detected, hand-held detectors will be used to define precisely the hot spot locations and the lateral distributions of contaminants, and the hot spot will be sampled. The distribution of spatial contaminants will be determined by collecting one soil sample at a depth of 6 to 12 in. below the hot spot and another sample 3 ft away at the same depth at which the hot spot was located. A VCA will be conducted to remove the artifact or hot spot.

The canyonside disposal area (SWMU No. 5-002) consists of discarded material that was pushed over the canyon rim and is spread out over the mesa side to the canyon bottom. A radiological and geophysical survey will be conducted using hand-held instruments across the entire disposal area and along the drainage area. If hot spots are located in the discarded material or in the drainage, they will be characterized. The geophysical data will be used to characterize any buried materials and to choose a discrete sampling method. The surveys will be extended beyond the discarded pits and down the drainage until radioactivity levels are no longer detected.

Soil samples will be analyzed **for metals;** gross-alpha, -beta, -gamma; gamma spectrometry; and alpha spectroscopy.

The radiological survey of Aggregate B will be followed by the geophysical survey. This investigation will focus on the following objectives:

- Detect and locate near-surface artifacts and debris at the canyonside disposal site that are potential sources of contamination.

- Provide confirmatory information on the location of the firing site (SWMU No. 5-001[a and b]).

Any artifacts or debris at or near the surface will be treated as a potential source of contamination. Therefore, when feasible, such near-surface artifacts and debris will be removed as a VCA and screened for contamination. Soil samples that are in contact with any contaminated debris or artifact will be characterized.

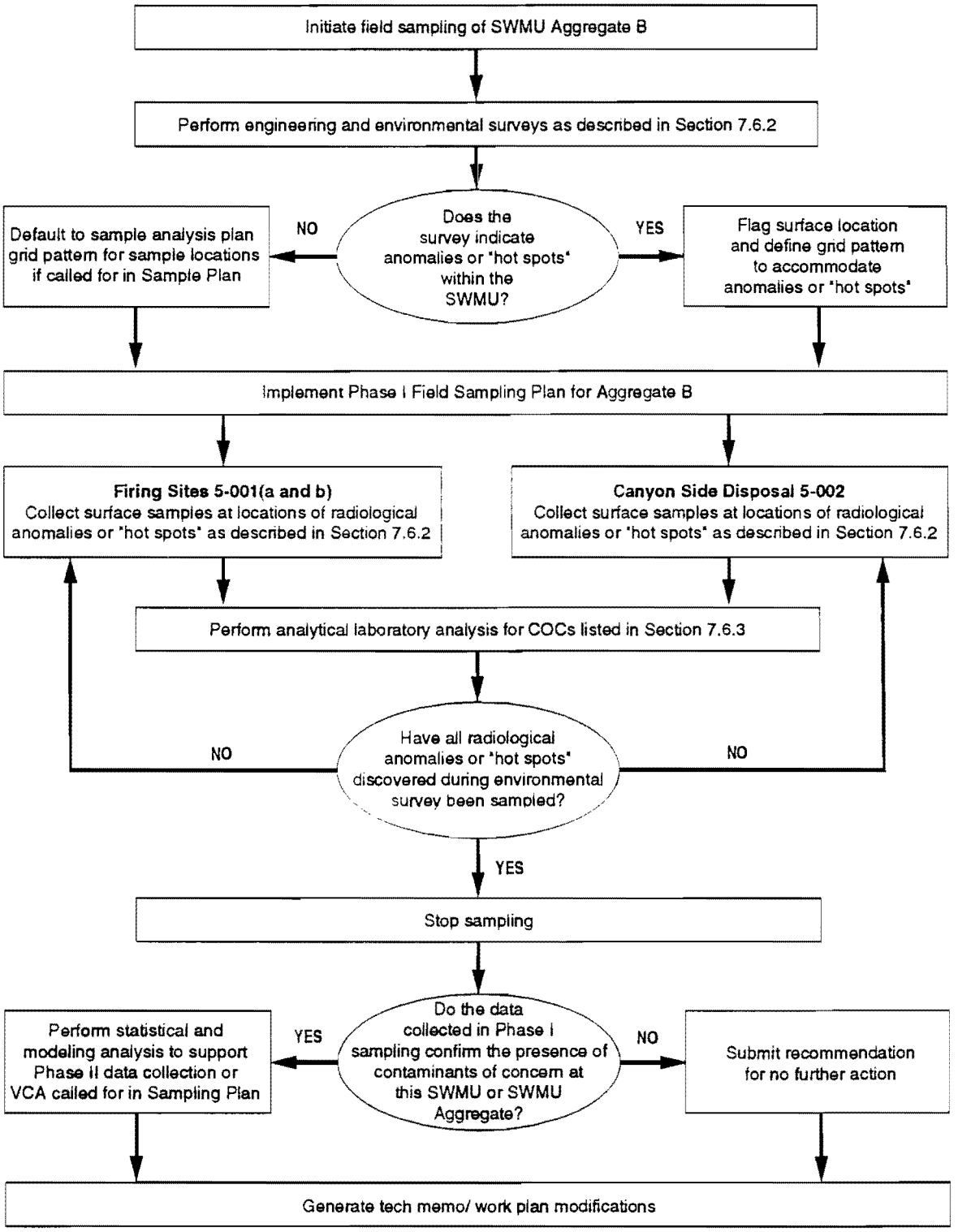


Figure 7-7. Decision logic for the sampling and analysis of SWMU Aggregate B.

7.6.3 Sample Screening and Analysis

Each soil sample will be screened using a scintillation detector for contact radiation. All sample packages must be screened for surface contamination and radiation. The soil samples will be analyzed for metals; gross-alpha, -beta, -gamma; gamma spectrometry; and alpha spectroscopy.

7.7 SWMU Aggregate C, Phase I

Aggregate C consists of SWMU No. 5-004, the former location of a septic tank, and SWMU No. 5-005(a) (formerly SWMU No. 5-005; see Table 1-1), a former French drain. Both SWMUs are listed in the HSWA Module VIII (EPA 1990, 0306). Both sites are located on a finger of Pajarito Mesa off of Puye Drive. The septic tank location (SWMU No. 5-004) is near the canyon edge on the south side of Puye Road, approximately 900 ft east of Pajarito Well #5 and 50 ft east of the calibration chamber (TA-5-20). SWMU No. 5-004 is the only Beta Site structure remaining at TA-5 (Figure 7-8). The former French drain (SWMU No. 5-005[a]) is located on the north side of Puye Road at the edge of Mortandad Canyon, just west of the former TA-5 firing sites of Aggregate B (Figure 7-9). A detailed description of the site activities and history of these SWMUs are presented in Section 3.2 of this Work Plan.

7.7.1 Sampling Plan Rationale and Objectives

Archival information indicates that the potential contaminants that may be present at the former septic tank, SWMU No. 5-004, include radioactive and unknown chemical constituents (Section 3.2). During site operations, liquid wastes from the laboratory building (TA-5-1) were discharged to the septic tank. Effluent from the tank was discharged to Cañada del Buey (Figure 7-8). The septic tank and lines were removed in 1960, and the site was surveyed for radioactivity in the 1985 D&D activities, but the site has not been characterized for the presence of hazardous chemical contamination. Also, a 1988 survey detected slightly above-background gamma activity. Subsurface contamination may be present beneath the former tank location, and surface contamination may be present downslope from the drain line discharge point.

Archival data indicates that the potential contaminants that may be present at the French drain, SWMU No. 5-005(a), include radioactive and unknown chemical constituents (Section 3.2). During site operations, liquid wastes from the control building (TA-5-4) passed through the French drain and discharged into the canyon. Contaminants were released to the shallow subsurface through perforations in the drain. Surface contamination may have also resulted downslope from the drain's discharge point. D&D activities conducted in 1985 concluded that contamination found in the area of the control building was released to the environment through the French drain that serviced the building (SWMU No. 5-005[a]). The French drain and underlying "affected" soils were removed as part of the LASCP D&D program in 1985. That effort focused on radioactive contamination, and the site was not characterized for hazardous chemical contamination.

The objective of this Phase I sampling plan is to determine the presence or absence of surface and subsurface contamination at the locations of the SWMUs. If contamination is confirmed to be present after the Phase I investigation, a Phase II investigation will be conducted to determine the nature and extent of contamination at the site. Sampling activities are biased toward areas in which residual contamination is most likely to be present based on the following conceptual model for this site:

- Previous D&D activities have removed most of the COCs although, in some cases, only radiological wastes were characterized; therefore, some chemical contamination was potentially missed.

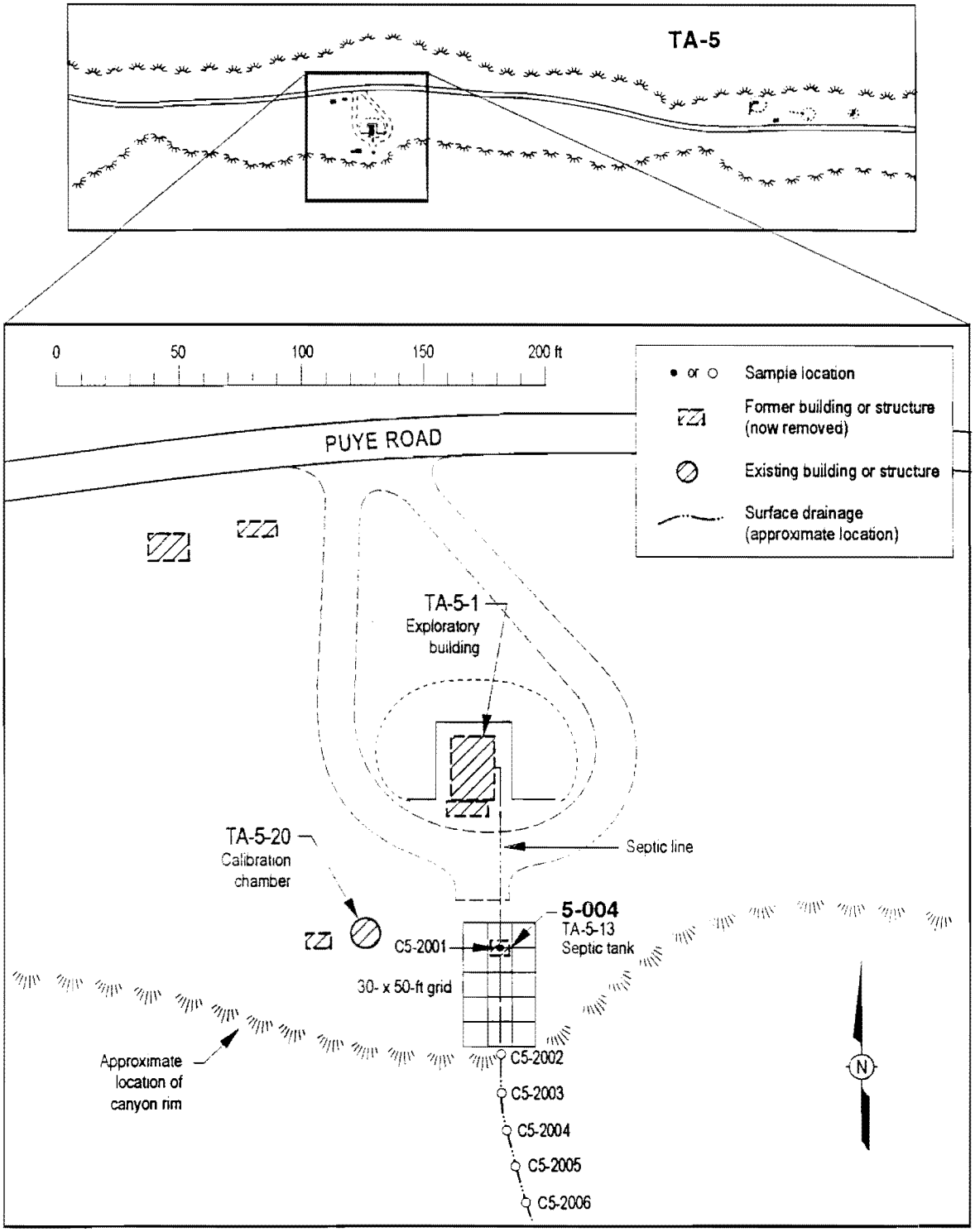


FIG 7-8 / 091393 LASL 1961 (ENG-R-2418)

Figure 7-8. Schematic sample location map for SWMU 5-004, Aggregate C.

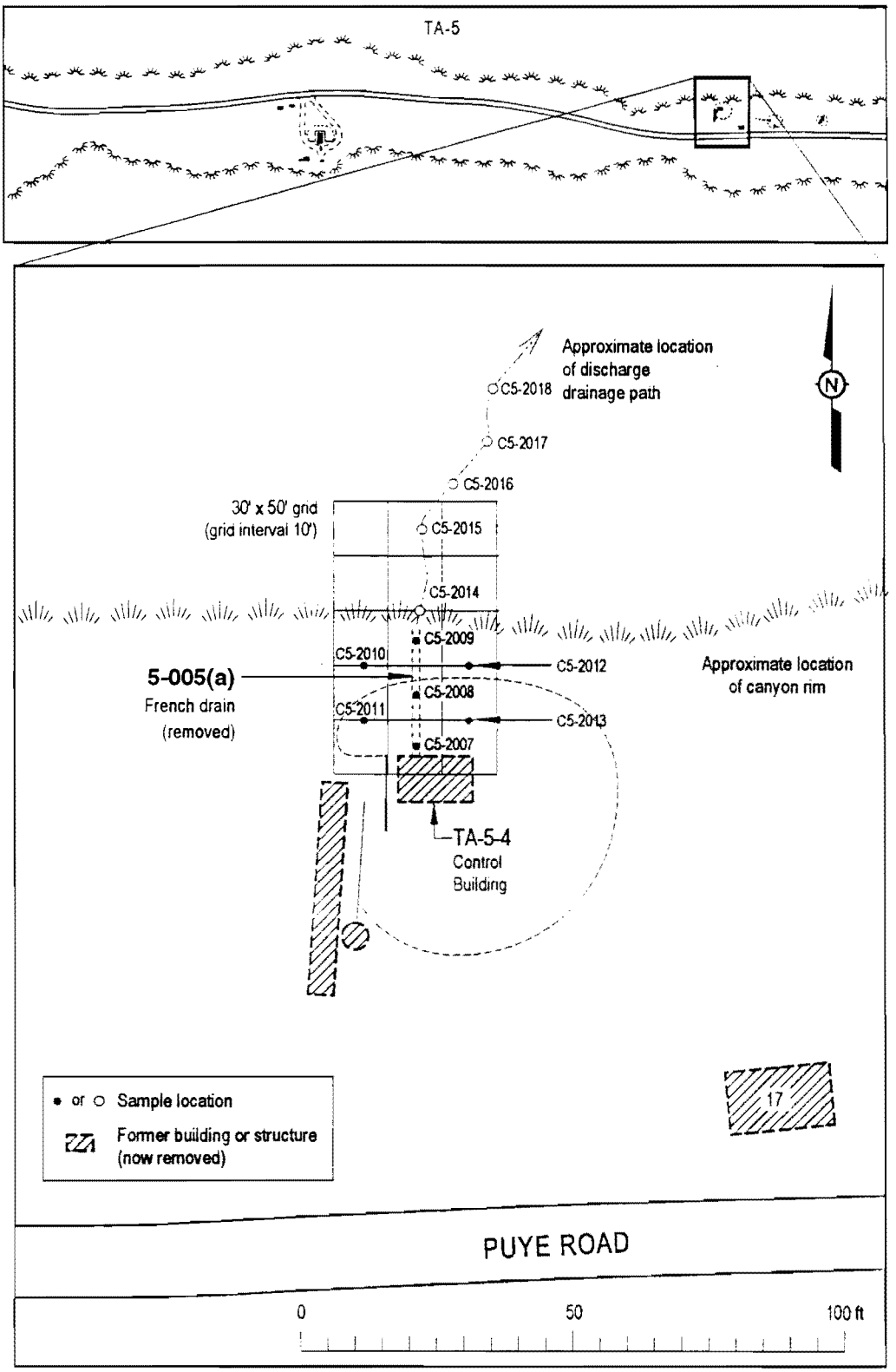


FIG 7-9 / 091393 LASL 1955 (ENG-R517, 3 of 3, Rev. 2); LASL 1961 (ENG-R-2418)

Figure 7-9. Schematic sample location map for SWMU 5-005(a), Aggregate C.

- Any remaining contaminant plumes may have moved because the liquid associated with the contaminants provided a transportation mechanism.

The surface investigation at Aggregate C is designed primarily to answer the following:

1) Does surface and subsurface contamination currently exist in Aggregate C?

2) Are there any near-surface artifacts remaining which represent potential contaminant release points?

3) What is the potential for surface and subsurface migration of contaminants?

Decision logic for Phase I field investigation activities to be conducted at SWMU Aggregate C is represented in Figure 7-10 and is discussed in the following text.

7.7.2 Phase I Field Investigation Activities

The land engineering survey will locate the former French drain (SWMU No. 5-005[a]) and its discharge point, and the former septic tank location (SWMU No. 5-004) and its drain line discharge point. This data will be recorded on base maps of the areas. A 30-ft-wide (east-west) by 50-ft-long (north-south) grid will be surveyed at each site to encompass the area potentially impacted by the French drain and septic tank. Individual grid blocks will be 10 ft by 10 ft. The grid for SWMU No. 5-004 will include the former location of the septic tank and the discharge point of the drain line (Figure 7-8). The grid for SWMU No. 5-005(a) will include the former location of the French drain and will extend beyond the canyon edge to include the drain line outfall (Figure 7-9).

Following the engineering survey, a radiation survey will be conducted at each site to identify potential radiological anomalies within the grid areas. At each site, a scintillation detector will be used to survey the entire grid area. The location and activities of radiological anomalies above natural background within the corresponding grid block will be recorded on the field log. Along with the grid radiation survey, a walkover survey of the discharge drainage channel below each outfall will be performed. The survey will be conducted in the erosional channels of the outfalls to measure radioactivity. These surveys will continue until no contaminants can be found using a scintillation detector. The locations of radiation anomalies detected in the channel will be flagged and the corresponding activities will be recorded on the field log.

The radiological survey of Aggregate C will be followed by a geophysical survey. This investigation will focus on the following objectives:

- Detect and locate near-surface artifacts and debris that are potential sources of contamination.

- Confirm the location of the French drain and septic tank (SWMU Nos. 5-004 and 5-005 [a]).

Any artifacts or debris on or near the surface will be treated as a potential source of contamination. Therefore, when feasible, such near-surface artifacts and debris will be removed as a VCA and screened for contamination. Soil samples that are in

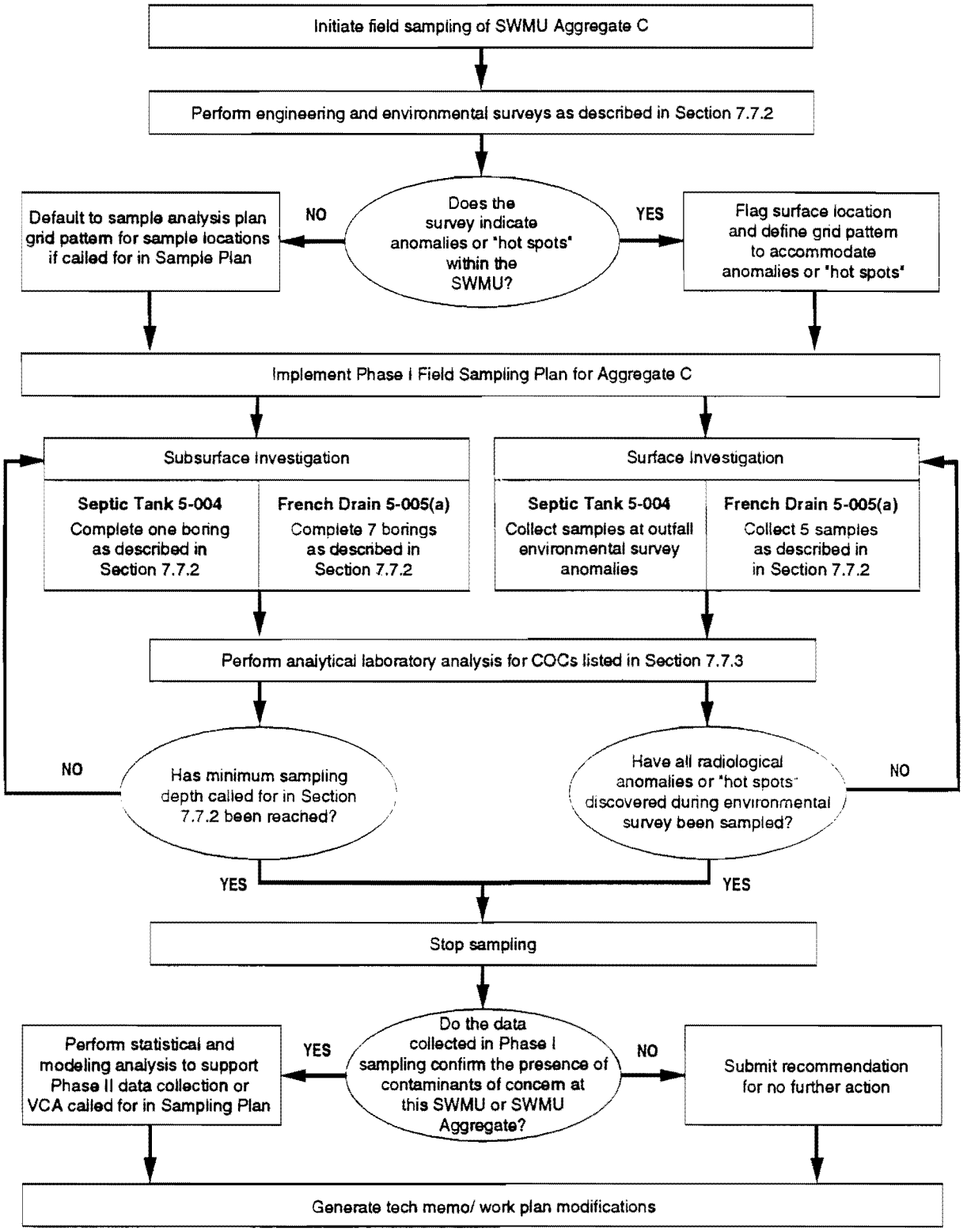


Figure 7-10. Decision logic for the sampling and analysis of SWMU Aggregate C.

contact with any contaminated debris or artifact will be characterized.

SWMU No. 5-004, Septic Tank – Subsurface Investigation

The septic tank, TA-5-13, was used between 1948 and 1959 to handle wastes from the laboratory building, TA-5-1. No information is available regarding the wastes that were discharged to the tank. However, a 1959 survey indicated that the tank was free of HE and radioactive contamination, but was contaminated with unspecified "acid." Hazardous chemical contamination is suspected at the site of the septic tank and beneath the outfall from the discharge line. The tank and all piping were removed in 1960, and removal was confirmed in 1985. No radioactive contamination was detected at the site during the 1985 D&D, but a 1988 survey detected slightly above-background gamma activity (Table 3-8). For this reason, radiation surveys will be conducted for the presence of radionuclides.

Subsurface soil samples will be collected from one boring at the site. The purpose of the borehole is to determine the presence or absence of soil contamination at the site of the former septic tank (Figure 7-8). The borehole will be placed at the former septic tank location. If radiological anomalies are detected during the environmental survey, the borehole will default to this location. If contamination is located, a Phase II program will be developed.

The one soil boring will be drilled to a minimum depth of 15 ft using a hollow-stem auger with a decontaminated 5-ft split-spoon core barrel. As each 5-ft section of core is retrieved from the borehole, the soil and/or rock will be screened with a radiation monitor and an OVA or a PID. Screening measurements will be recorded on the daily field log. If VOCs are indicated, a discrete sample will be collected and analyzed. A sample will be collected on the basis of radiological monitoring. If radiation levels are at or below background, a random sample will be taken within the 5-ft interval. If radiation levels are above background, a sample will be taken at that location within the 5-ft interval. The exact depth of the samples will be recorded on the daily field log. Drilling will stop when field screening determines that two consecutive core intervals are at or below background measurements for radiation.

Collected samples will be screened for radioactivity and submitted to the laboratory for analyses. Each sample will be analyzed for metals by ICPES; SVOCs; gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy, and HE in soil.

SWMU No. 5-004, Septic Tank – Surface Investigation

Because canyon sides were not investigated during the 1985 LASCP D&D, the discharge channel needs to be characterized for the presence of hazardous chemical and radiological contamination. Surface soil/rock samples will be collected from any locations in the erosional drainage that show anomalies from the field environmental surveys or from 5 locations along the erosional axis at 15-ft intervals where topography allows (Figure 7-8).

Each soil sample will be collected **from 0 to 6 in. below the surface** with a clean stainless-steel trowel. If soil is not present at the sample location, a hammer and chisel will be used to collect a rock-chip sample. Each sample will be screened for radiation before submittal to the laboratory for analysis.

Samples will be analyzed for gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy; SVOCs; metals; and **HE in soil.**

SWMU No. 5-005(a), French Drain – Subsurface Investigation

The French drain was constructed in 1945 and abandoned in 1959, and was used for the discharge of liquid wastes from the control building, TA-5-4. The type of wastes introduced into the drain are unknown, but are suspected to have included radioactive and chemical constituents (Section 3.2, Description of TA-5, Beta Site). Although the drain and affected soils were removed in 1985 during site D&D activities, the site was not characterized for the extent of hazardous constituents. The D&D effort focused solely on the removal of radioactive contamination.

Subsurface soil samples will be collected from seven soil borings installed at the site. The purpose of these boreholes is to determine the presence or absence of soil contamination at the site of the former French drain. Boring locations will be placed at radiological anomalies identified along the length of the former drain location. If radiological anomalies are not present, borings will be placed at the default grid locations. Figure 7-9 shows the locations of samples that will be collected at SWMU No. 5-005(a).

Borings at the French drain will be installed, screened, and sampled in the same manner employed at the septic tank site, SWMU No. 5-004.

Samples will be analyzed for gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy; SVOCs; and metals.

SWMU No. 5-005(a), French Drain – Surface Investigation

Available archival information indicates that the discharge channel at the former French drain was not investigated during 1985 D&D activities conducted at TA-5. **Therefore, 5 surface soil/rock samples from 0 to 6 in. below the surface will be collected at 15-ft intervals along the axis of the drainage.** Surface sample collection will follow the methods described for the septic tank surface investigation.

Samples will be analyzed for gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy; SVOCs; and metals.

7.7.3 Sample Screening and Analysis

Each core and soil/rock sample collected will be screened for contact radiation. All sample packages must be screened for surface contamination and contact radiation. All samples from the former septic tank location (SWMU No. 5-004) will be analyzed for gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy; SVOCs; metals; and **HE in soils.** All samples from the French drain (SWMU No. 5-005[a]) will be analyzed for gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy; SVOCs, and metals. Table 7-2 outlines the total number of matrix and quality assurance/quality control (QA/QC) samples required for this field investigation, the corresponding analyses, and sample requirements.

Appendix B should be consulted for procedures regarding the use of specified field sampling equipment; sample handling, packaging, and shipping; equipment decontamination; and field instruments.

TABLE 7-2

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE C

			Analyses Required*							
SWMU	SAMPLE NUMBER	DEPTH	Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	HE in Soil by USATHAMA
5-004	C5-2001-B1	0-5 ft	1	1	1	1	**	1	0	1
	C5-2001-B2	5-10 ft	1	1	1	1	**	1	0	1
	C5-2001-B3	10-15 ft	1	1	1	1	**	1	0	1
	C5-2002-S1	surface	1	1	1	1	**	1	0	1
	C5-2003-S1	surface	1	1	1	1	**	1	0	1
	C5-2004-S1	surface	1	1	1	1	**	1	0	1
	C5-2005-S1	surface	1	1	1	1	**	1	0	1
	C5-2006-S1	surface	1	1	1	1	**	1	0	1
5-005 (a)	C5-2007-B1	0-5 ft	1	1	1	1	**	1	0	0
	C5-2007-B2	5-10 ft	1	1	1	1	**	1	0	0
	C5-2007-B2	10-15 ft	1	1	1	1	**	1	0	0
	C5-2008-B1	0-5 ft	1	1	1	1	**	1	0	0
	C5-2008-B2	5-10 ft	1	1	1	1	**	1	0	0
	C5-2008-B3	10-15 ft	1	1	1	1	**	1	0	0
	C5-2009-B1	0-5 ft	1	1	1	1	**	1	0	0
	C5-2009-B2	5-10 ft	1	1	1	1	**	1	0	0
	C5-2009-B3	10-15 ft	1	1	1	1	**	1	0	0
	C5-2010-B1	0-5 ft	1	1	1	1	**	1	0	0
	C5-2010-B2	5-10 ft	1	1	1	1	**	1	0	0
	C5-2010-B3	10-15 ft	1	1	1	1	**	1	0	0
	C5-2011-B1	0-5 ft	1	1	1	1	**	1	0	0
	C5-2011-B2	5-10 ft	1	1	1	1	**	1	0	0
	C5-2011-B3	10-15 ft	1	1	1	1	**	1	0	0
	C5-2012-B1	0-5 ft	1	1	1	1	**	1	0	0
	C5-2012-B2	5-10 ft	1	1	1	1	**	1	0	0
	C5-2012-B3	10-15 ft	1	1	1	1	**	1	0	0
	C5-2013-B1	0-5 ft	1	1	1	1	**	1	0	0
	C5-2013-B2	5-10 ft	1	1	1	1	**	1	0	0
	C5-2013-B3	10-15 ft	1	1	1	1	**	1	0	0
	C5-2014-S1	surface	1	1	1	1	**	1	0	0
	C5-2015-S1	surface	1	1	1	1	**	1	0	0
	C5-2016-S1	surface	1	1	1	1	**	1	0	0
	C5-2017-S1	surface	1	1	1	1	**	1	0	0
	C5-2018-S1	surface	1	1	1	1	**	1	0	0
Rinsate Blanks			2	2	2	2	**	2	0	1
Bottle Blanks			2	2	2	2	**	2	0	1
Trip Blanks			0	0	0	0	**	0	0	0
Duplicates			2	2	2	2	**	2	0	1
TOTALS			40	40	40	40	0	40	0	11

*Section 5.0 ofthe Generic Quality Assurance (QA) Project Plan for RCRA Facility Investigations for the LANL ER Program (LANL 1991, 0843), includes U.S. EPASolid Waste (SW) 846 quantitative and detection limits for the various required analytes.

** A discrete sample will be collected and analyzed for VOCs only if VOCs are first detected using the appropriate OVA, FID, or PID field instrument.

7.8 SWMU Aggregate D, Phase I

Aggregate D includes five sites associated with TA-35. All of these SWMUs are listed in the HSWA Module VIII (EPA, 1990, 0306; see Table 1-1). SWMU Nos. 35-003(a-q) include the location of a former wastewater treatment plant and related facilities, including outfalls, and SWMU No. 35-003(r) includes a canyon disposal area. SWMU No. 35-003(j and k) are not associated with the wastewater treatment plant and are discussed in Aggregate I. SWMU No. 35-003 (i) includes tanks that were incorrectly identified as part of the wastewater treatment plan in the 1988 and 1990 SWMU reports (International Technology Corporation 1988, 0329; LANL 1990, 0145). The SWMU has been analyzed under criteria found in Chapter 6.0 and was subsequently recommended for no further action. These are Phase I characterization areas according to the process outlined in Chapter 5.0. The following SWMUs are included in this plan:

- 35-003(d, l, and q), holding tanks and associated piping
- 35-003(e, f, g, m, and o) surge tanks and associated piping
- 35-003(misc.) piping and 35-003(h) retention tank
- 35-003(r) canyon disposal area
- 35-003(p) recommended for NFA
- 35-003(a, b, c, and n), **phase separator pit,** holding tanks, and associated piping **recommended for sampling in concert with D&D**

Archival information (Section 3.3.2.3, Past Waste Spills, Releases, and Incidents) provides many references to spills and leaks of radiological waste; however, very little information is provided on other hazardous materials in the waste stream or associated with the radiological waste. A list of potential waste materials is located in Section 3.3.2.2, A Summary of Potential Waste Materials. Documentation of radionuclides released is consistent while associated chemicals are not documented with any congruity. One of the larger documented spills occurred in 1956 when 21,200 gal. of wastewater and sludge were accidentally leaked into the canyon to SWMU No. 35-003(r) from SWMU No. 35-003(d) holding tanks. Other releases occurred from 1951 to 1963 (Section 3.3.2.3).

Documentation indicates that most of the associated structures and lines of the wastewater treatment plant were removed and/or decontaminated between 1980 and 1985 (Table 3-11, Description of Structures at TA-35). Because of the numerous spills that occurred in the area of SWMU Nos. 35-003(a-q) and 35-003(r), results from health and safety/environmental monitoring following D&D activity indicate radioactive contamination still is present.

SWMU Nos. 35-003(a, b, c, and n), the phase separator pit and associated structures, were originally scheduled to be sampled with other Aggregate D SWMUs; however, the original SAP for SWMU Nos. 35-003(a, b, c, and n) assumed that the structures would have been removed as part of D&D operations. Because the structures were not removed, a formal SAP will be delayed and done in concert with D&D planning likely to take place in FY94 or 95.

7.8.1 Sampling Plan Rationale and Objectives

The objective of this Phase I sampling plan is to determine the presence or absence of surface and subsurface contamination at SWMU Aggregate D within TA-35. If contamination is confirmed to be present after the Phase I investigation, a Phase II investigation will be conducted to determine the nature and extent of contamination at the site. Sampling activities are biased toward areas in which residual contamination is most likely to be present on the basis of the following conceptual model for a release at this site:

- Previous D&D activities have removed most of the COCs although, in some cases, archival information indicates some contaminants were missed.

- Because of the volume and the regularity of the spills, any remaining contaminant could be at depth and widespread. This could be true in the SWMU No. 35-003(d, l, and m) and SWMU No. 35-003(r). As a result, random sampling across some SWMUs is planned. Material was spilled on the surface at SWMU No. 35-003(d) and washed into SWMU No. 35-003(r), which feeds into Ten Site Canyon. Surface water could provide a major transport mechanism.

- Liquids and sludge have leaked from holding tanks into surrounding soils and tuff. D&D information, while sketchy, provides insight into depths at which contaminants were found. The locations at which contaminants were found during D&D activities have been backfilled with fill material. These locations are assumed to be near the interface with bedrock tuff. Because fill material may contain a higher moisture content than the indigenous soils, transport near the tuff interface may be accelerated. Surface water in erosional cuts is a likely transport mechanism. An erosional channel now transects the area in which fill material was placed, indicating that surface transport is likely.

- Subsurface leakage from underground waste lines into surrounding soils is suspected. D&D information indicates that some pipes leaked contaminants into the surrounding soils. In some cases these soils were removed; in other cases the piping was removed and the trenches backfilled. The majority of these trenches are now covered with asphalt. The transport of contaminants in these trenches is considered to be localized within the vicinity of the trenches.

- The grid patterns planned for this aggregate are thought to cover the extent of the SWMUs. The grids vary in size and configuration to cover the projected extent of the SWMUs. The extent of the grids will be adjusted during field examination as needed.

- Models have been applied to SWMU Nos. 35-003(d and r) to estimate migration of previously spilled COCs.

The surface investigation at Aggregate D is designed to answer the following questions:

1) Does surface and subsurface contamination currently exist in Aggregate D?

2) Are there any near-surface artifacts remaining that represent potential contaminant release points?

3) What is the potential for surface and subsurface migration of contaminants?

Geologic data will be collected from Aggregate D to support transport model calculations.

A decision logic diagram for Phase I field investigation activities to be conducted at SWMU Aggregate D is presented in Figure 7-11 and discussed in the following text.

7.8.2 Phase I Field Investigation Activities

The Phase I investigation of Aggregate D consists of the engineering survey and environmental survey discussed in Section 7.4, and surface and subsurface sampling indicated in Figure 7-12 through 7-16.

The radiological survey discussed in Section 7.4.2 will use a scintillation detector on traverses spaced 20 ft apart at all sites except for SWMU No. 35-003(r) at which traverses spaced 100 ft apart will be conducted when topography allows. Surface sampling locations will be selected depending on the results of these traverses or will default to grid points. At SWMU No. 35-003 (r), the focus of the surveys will be on the erosional channels and the more widely spaced traverses will be surveyed to gather data across a large area. Subsurface sampling will be conducted when the radiological survey of SWMU No. 35-003 (r) indicates an anomaly at locations at which samples can be obtained. The majority of other SWMUs have undergone extensive D&D and have been backfilled with clean soils; therefore, the environmental surveys are expected to yield limited results.

A characterization borehole will be drilled on the east end of TA-35. Geologic record logs will be kept that describe lithologic changes, stratigraphic contacts, and welding characteristics of the tuff. The logs will note fracture frequency, fracture coating, and dip of fractures. Data from coring will be incorporated into the frameworks studies.

Fracture mapping of the two adjacent canyon walls will be conducted. The logs will include data on the fracture frequency along a measured section, fracture coating, and strike and dip of fractures. Data from fracture mapping will be incorporated into the framework studies.

SWMU Nos. 35-003 (d, l, and q) Surface and Subsurface Investigations

This site once included four 50,000-gal. tanks (SWMU No. 35-003[d]), a pump pit (SWMU No. 35-003 [l]), and a pipe trench (SWMU No. 35-003[q]). This area was beset with numerous spills of large volumes of highly contaminated materials. The physical structures were removed during previous D&D operations and the entire area has been backfilled. At SWMU Nos. 35-003(d, l, and q), the grid pattern is 30 ft by 30 ft and is projected to cover the extent of this Phase I investigation (Figure 7-13 and Table 7-3). To complement the grid pattern sampling, 5 surface samples will be obtained from an erosional channel that cuts through the site. This erosional channel is a potential site transport mechanism for surface contaminants. Locations along erosion channels in which contamination is detected during radiation surveys will be sampled. Surface soil samples in the channels will be obtained in the first 6 in. of soil using a stainless-steel or Teflon scoop. Boring will be accomplished using a hollow-

TABLE 7-3

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE D

SWMU	SAMPLE NUMBER	DEPTH	Analyses Required *							
			Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
35-003 (d, l, and q)	D35-2004-B1	0-2 ft	1	1	1	1	**	1	1	1
	D35-2004-B2	tuff†	1	1	1	1	**	1	1	1
	D35-2004-B3	5-10 ft	1	1	1	1	**	1	1	1
	D35-2004-B4	60-65 ft	1	1	1	1	**	1	1	1
	D35-2004-B5	95-100 ft	1	1	1	1	**	1	1	1
	D35-2005-B1	0-2 ft	1	1	1	1	**	1	1	1
	D35-2005-B2	tuff†	1	1	1	1	**	1	1	1
	D35-2005-B3	30-35 ft	1	1	1	1	**	1	1	1
	D35-2005-B4	45-50 ft	1	1	1	1	**	1	1	1
	D35-2005-B5	95-100 ft	1	1	1	1	**	1	1	1
	D35-2006-B1	0-2 ft	1	1	1	1	**	1	1	1
	D35-2006-B2	tuff†	1	1	1	1	**	1	1	1
	D35-2006-B3	50-55 ft	1	1	1	1	**	1	1	1
	D35-2006-B4	65-70 ft	1	1	1	1	**	1	1	1
	D35-2006-B5	95-100 ft	1	1	1	1	**	1	1	1
	D35-2007-B1	0-2 ft	1	1	1	1	**	1	1	1
	D35-2007-B2	tuff†	1	1	1	1	**	1	1	1
	D35-2007-B3	35-40 ft	1	1	1	1	**	1	1	1
	D35-2007-B4	60-65 ft	1	1	1	1	**	1	1	1
	D35-2007-B5	95-100 ft	1	1	1	1	**	1	1	1
	D35-2008-B1	0-2 ft	1	1	1	1	**	1	1	1
	D35-2008-B2	tuff†	1	1	1	1	**	1	1	1
	D35-2008-B3	60-65 ft	1	1	1	1	**	1	1	1
	D35-2008-B4	70-75 ft	1	1	1	1	**	1	1	1
	D35-2008-B5	95-100 ft	1	1	1	1	**	1	1	1
	D35-2009-B1	0-2 ft	1	1	1	1	**	1	1	1
	D35-2009-B2	tuff†	1	1	1	1	**	1	1	1
	D35-2009-B3	80-85 ft	1	1	1	1	**	1	1	1
	D35-2009-B4	90-95 ft	1	1	1	1	**	1	1	1
	D35-2009-B5	95-100 ft	1	1	1	1	**	1	1	1
	D35-2010-B1	0-2 ft	1	1	1	1	**	1	1	1

TABLE 7-3 (continued)

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE D

			Analyses Required *							
SWMU	SAMPLE NUMBER	DEPTH	Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
35-003 (d,l, andq)	D35-2010-B2	tuff†	1	1	1	1	**	1	1	1
	D35-2010-B3	35-40 ft	1	1	1	1	**	1	1	1
	D35-2010-B4	90-95 ft	1	1	1	1	**	1	1	1
	D35-2010-B5	95-100 ft	1	1	1	1	**	1	1	1
	D35-2011-B1	0-2 ft	1	1	1	1	**	1	1	1
	D35-2011-B2	tuff†	1	1	1	1	**	1	1	1
	D35-2011-B3	20-25 ft	1	1	1	1	**	1	1	1
	D35-2011-B4	60-65 ft	1	1	1	1	**	1	1	1
	D35-2011-B5	95-100 ft	1	1	1	1	**	1	1	1
	D35-2012-B1	0-2 ft	1	1	1	1	**	1	1	1
	D35-2012-B2	tuff†	1	1	1	1	**	1	1	1
	D35-2012-B3	20-25 ft	1	1	1	1	**	1	1	1
	D35-2012-B4	30-35 ft	1	1	1	1	**	1	1	1
	D35-2012-B5	95-100 ft	1	1	1	1	**	1	1	1
	D35-2013-B1	0-2 ft	1	1	1	1	**	1	1	1
	D35-2013-B2	tuff†	1	1	1	1	**	1	1	1
	D35-2013-B3	30-35 ft	1	1	1	1	**	1	1	1
	D35-2013-B4	60-65 ft	1	1	1	1	**	1	1	1
	D35-2013-B5	95-100 ft	1	1	1	1	**	1	1	1
	D35-2014-A1	0-2 ft	1	1	1	1	**	1	1	1
	D35-2015-A1	0-2 ft	1	1	1	1	0	1	1	1
	D35-2208-S1		1	1	1	1	0	1	1	1
	D35-2209-S1		1	1	1	1	0	1	1	1
	D35-2210-S1		1	1	1	1	0	1	1	1
	D35-2211-S1		1	1	1	1	0	1	1	1
	D35-2212-S1		1	1	1	1	0	1	1	1
Rinsate Blanks			2	2	2	2	**	2	2	2
Bottle Blanks			0	0	0	2	**	2	2	2
Trip Blanks			0	0	0	0	**	0	0	0
Duplicates			2	2	2	2	**	2	2	2
TOTALS			61	61	61	63	0	63	63	63

*Section 5.0 ofthe Generic Quality Assurance (QA) Project Plan for RCRA Facility Investigations for the LANL ER Program (LANL 1991, 0843), includes U.S. EPASolid Waste (SW) 846 quantitative and detection limits for the various required analytes.

** A discrete sample will be collected and analyzed for VOCs only if VOCs are first detected using the appropriate OVA, FID, or PID field instrument.

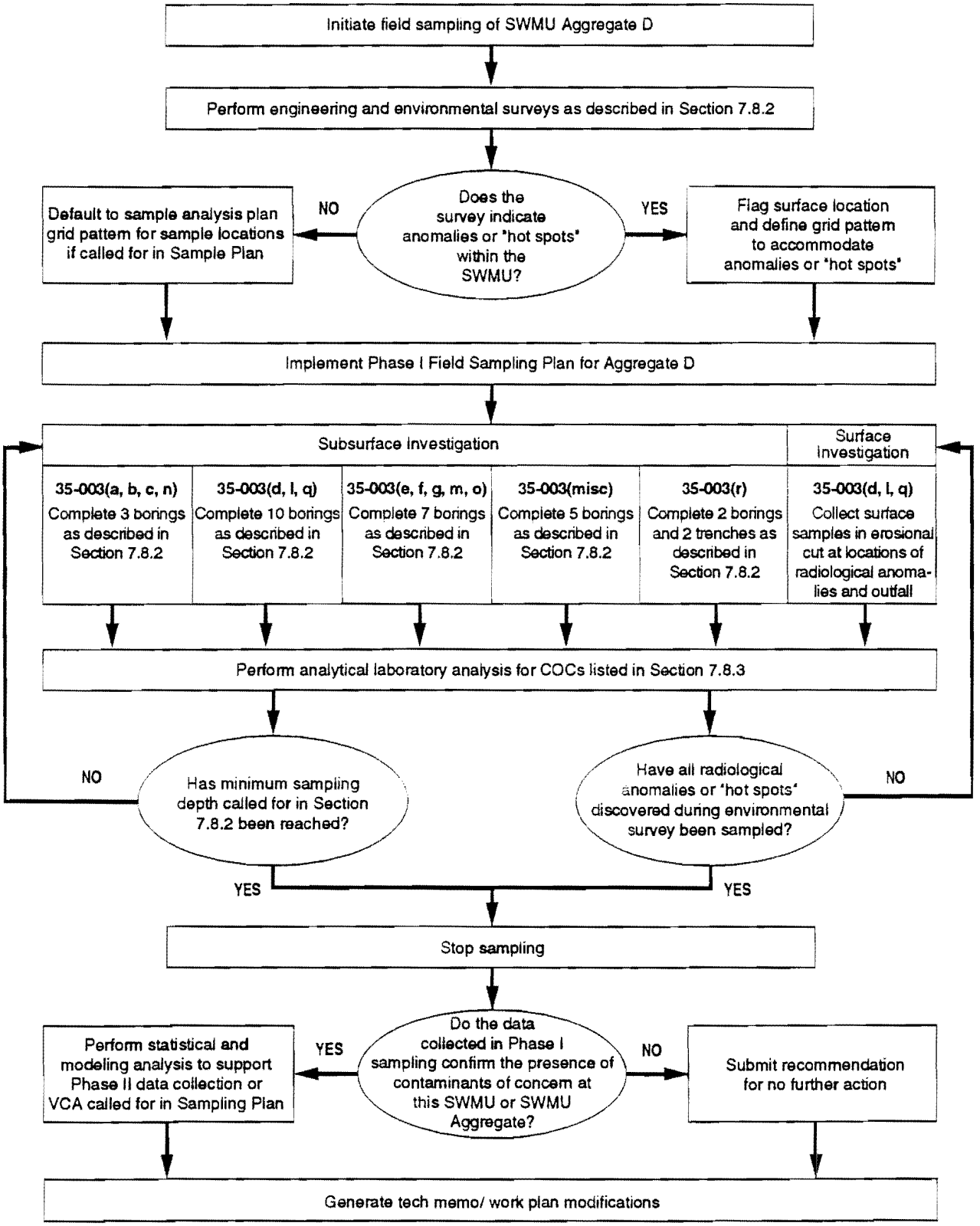


Figure 7-11. Decision logic for the sampling and analysis of SWMU Aggregate D.

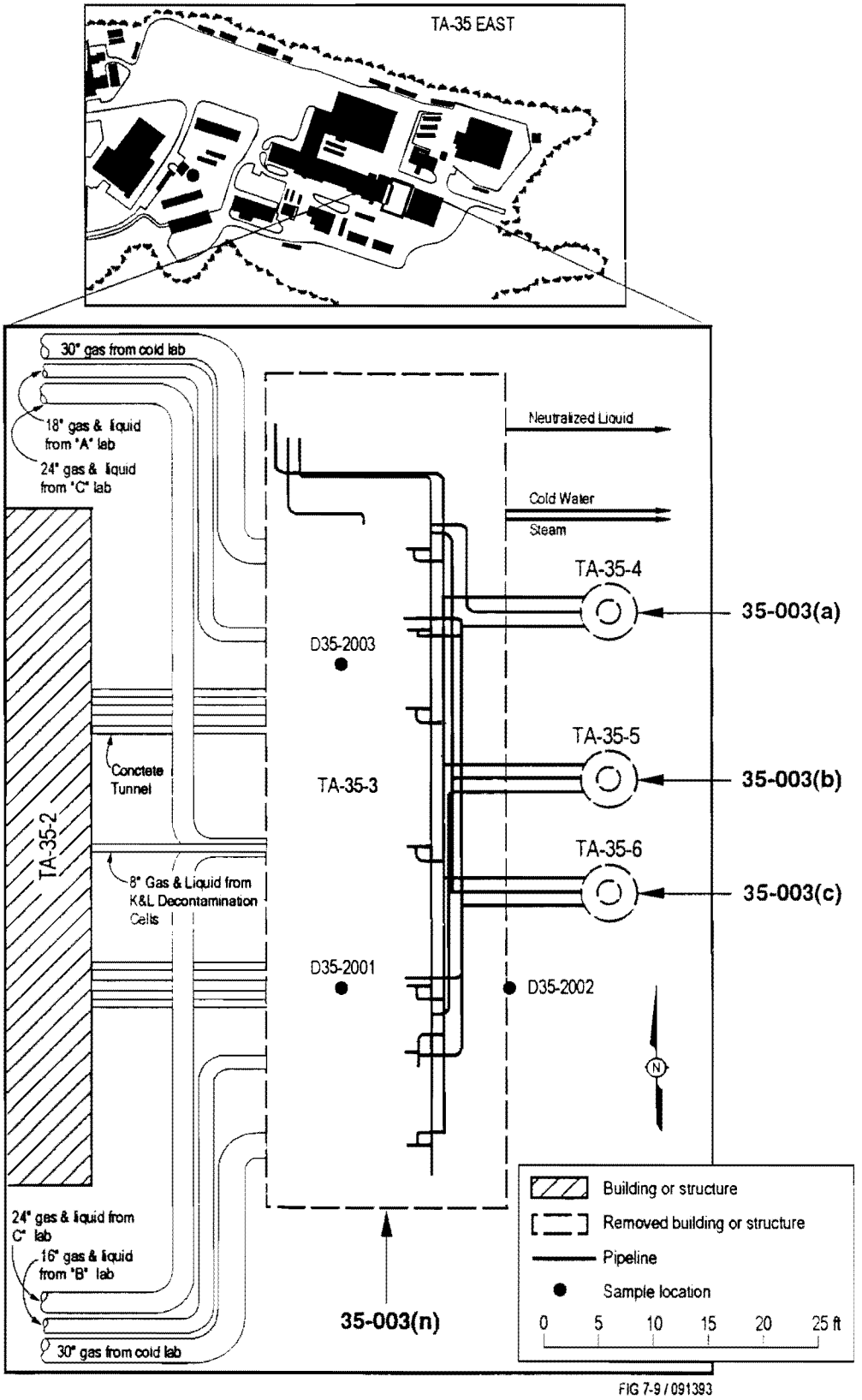


Figure 7-12. Schematic sample location map for SWMUs 35-003(a, b, c, and n), Aggregate D.

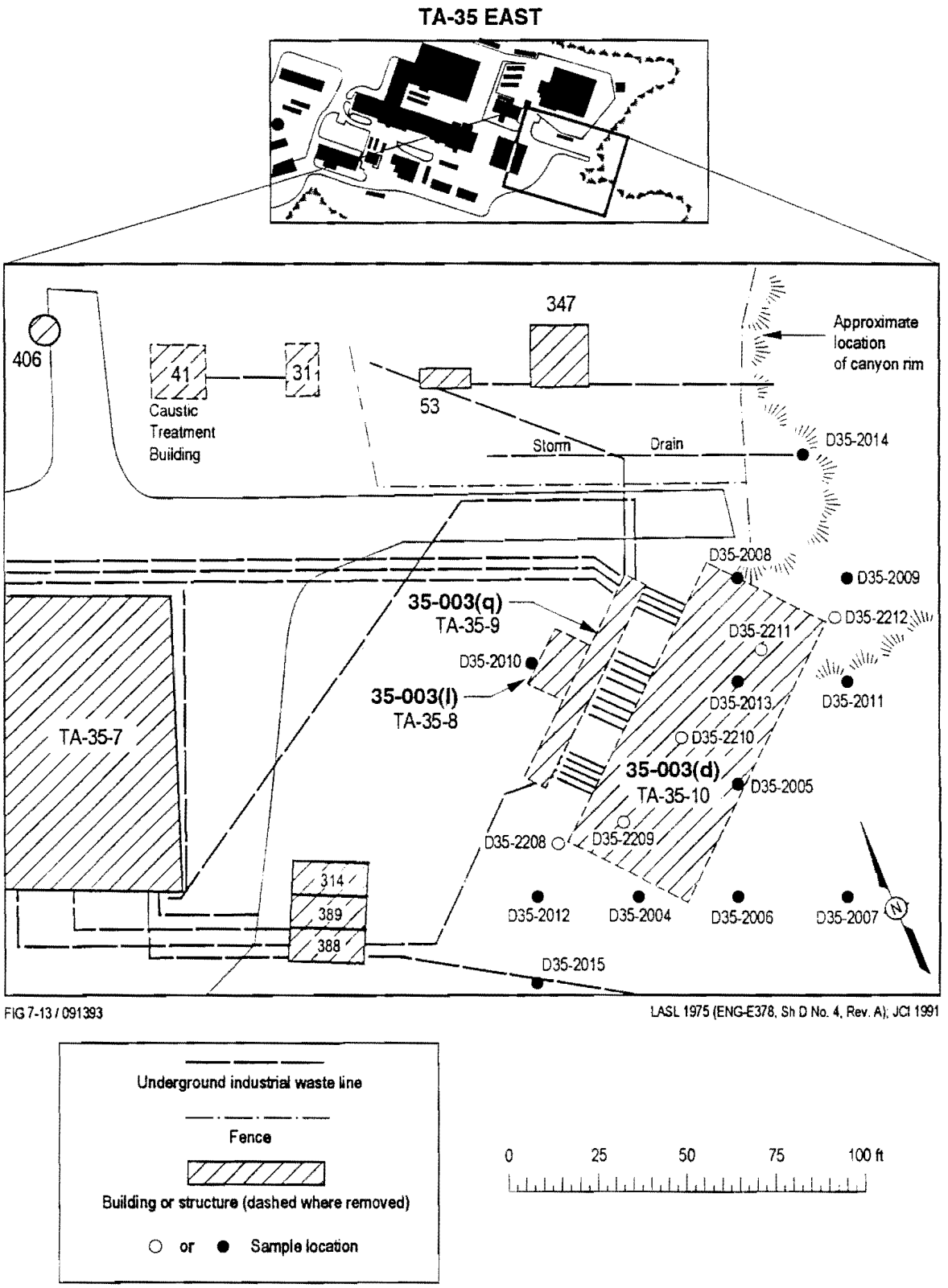


Figure 7-13. Schematic sample location map for SWMUs 35-003(d, l, and q), Aggregate D.

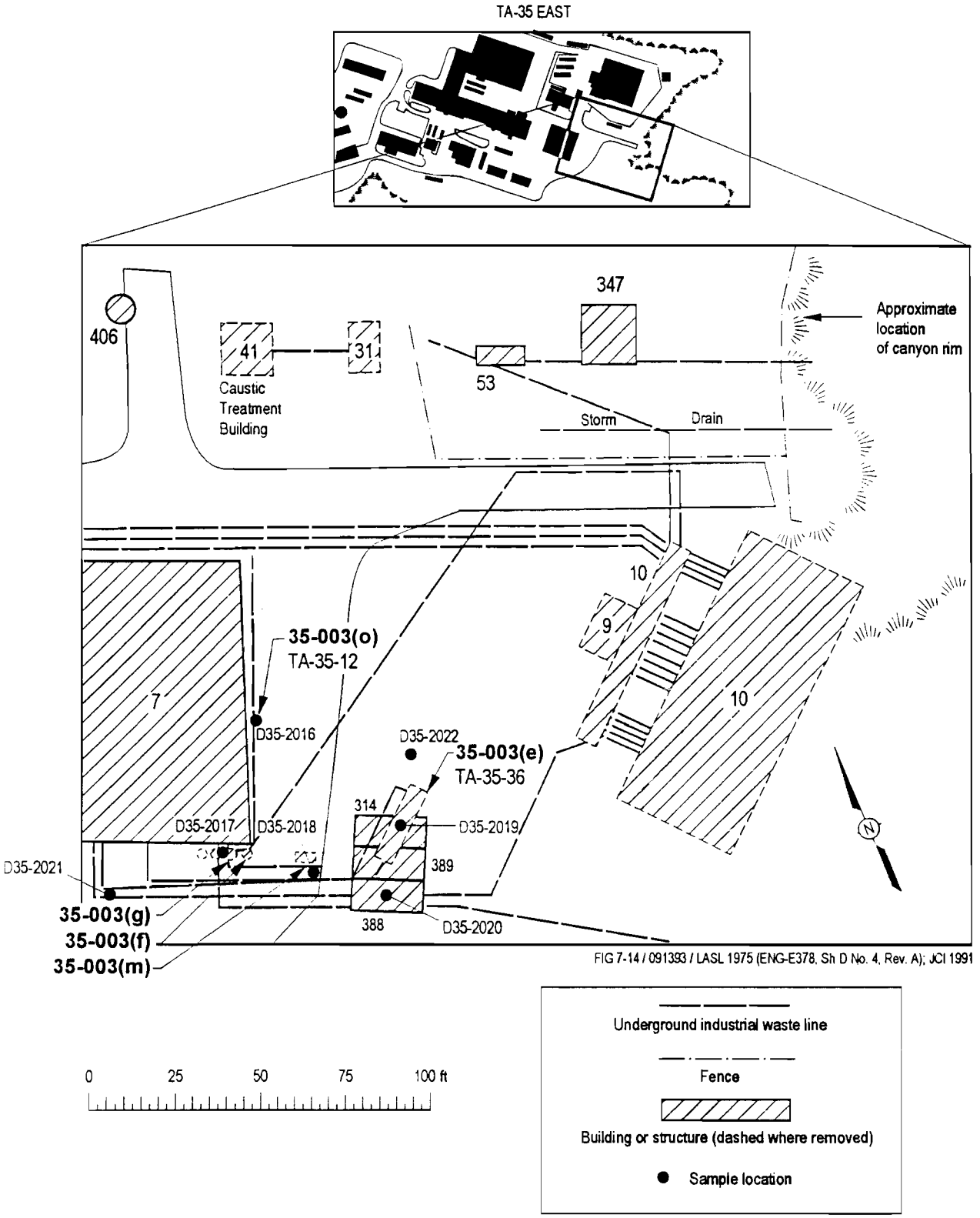


Figure 7-14. Schematic sample location map for SWMUs 35-003(e, f, g, m, and o), Aggregate D.

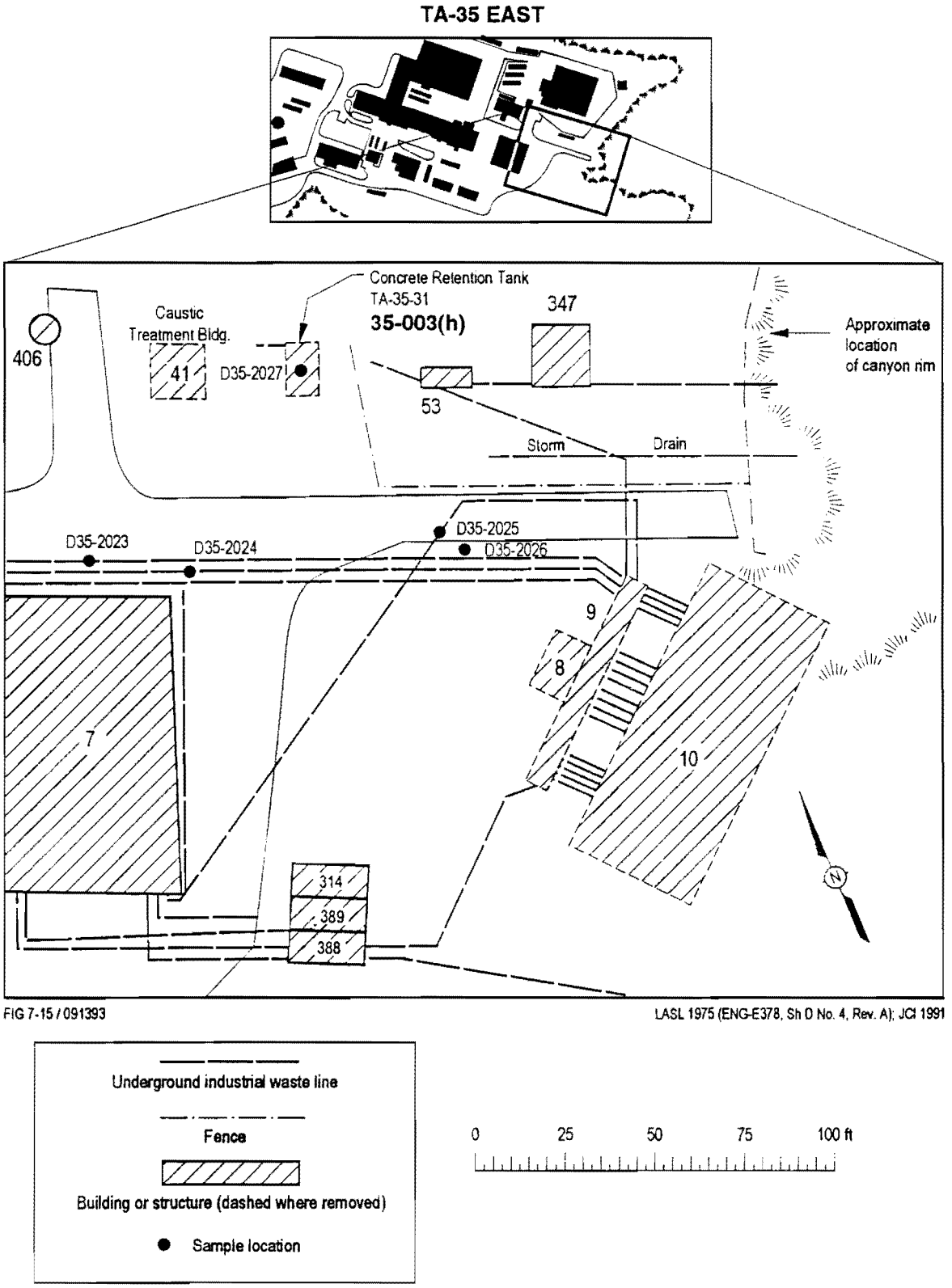


Figure 7-15. Schematic sample location map for SWMUs 35-003 (misc), Aggregate D.

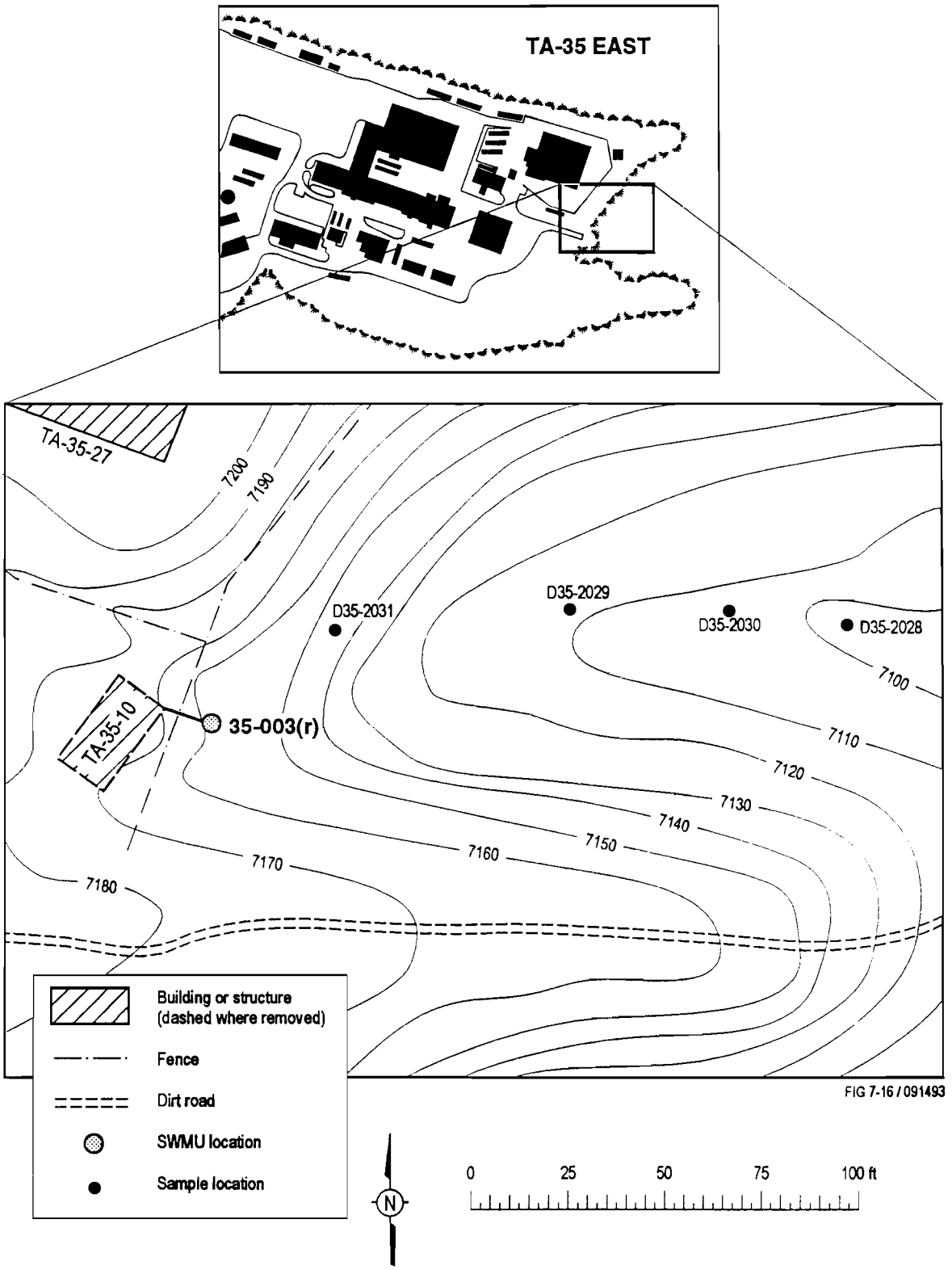


Figure 7-16. Schematic sample location map for SWMU 35-003(r), Aggregate D.

stem auger while a 5-ft split-barrel core sampler will continuously collect soil samples. Two sampling intervals (Table 7-3) will be determined using a random number generator. In addition, samples will be taken from the first 2 ft of borehole below the surface, **at the backfill-tuff (or native soil-tuff) contact,** and from the last interval at maximum depth. Once boreholes reach the bedrock, a wireline coring technique will be used with the same sample interval as the hollow-stem auger. Modeling information indicates borings should reach maximum depths of approximately 100 ft. The first 2 ft at all locations will be sampled using the 2-ft split barrel and the remaining samples will be taken from the 5-ft split barrel. Samples will be taken from two intervals using a random number generator and will be taken at maximum depth. At each 5-ft interval selected for sampling (Table 7-3), one sample, which indicates the highest field screening for radioactivity, will be collected. If screening results from any selected interval are negative, a sample from the recovered section's midpoint will be collected. To complement the random sequence samples, a soil/rock sample from all recovered intervals that indicate contamination from field screening will be sent to the laboratory for further analysis.

At SWMU Nos. 35-003 (d, l, and q), 10 subsurface sample locations were selected for borings and samples will be sent to the laboratory for analysis (Figure 7-13). Surface sampling **(borehole locations D35-2014 and D35-2015)**, where topography allows, will also be gathered at outfalls from lines 71 and 95 (Figure 7-13).

SWMU Nos. 35-003(e, f, g, m, and o) Surface and Subsurface Investigation

SWMU Nos. 35-003(e, f, g, m, and o), are also associated with the wastewater treatment plant. Sampling will be conducted on varying grid patterns. At SWMU Nos. 35-003(e, f, g, m, and o), the grid pattern will be 20 ft by 20 ft, which is anticipated to cover the extent of the site (Figure 7-14 and Table 7-4). SWMU Nos. 35-003(f, g, m, and o) have asphalt pavement covering the potentially contaminated soil/tuff. Sampling will begin once the asphalt is completely penetrated. Removed asphalt will be analyzed through a field radiological survey. Boreholes will be drilled to a maximum depth of 30 ft using a hollow-stem auger while a 5-ft split-barrel core sampler will continuously collect soil samples. Two sampling intervals (Table 7-4) will be determined using a random number generator. Additionally, samples will be taken from the first 2 ft of hole beneath the surface and will be taken from the last interval at the maximum depth of 30 ft. Once sampling boreholes reach the bedrock, a wireline coring technique will be used with the same sample interval as described using the hollow-stem auger. The first 2-ft beneath the surface at all locations will be sampled using the 2-ft split barrel and the remaining samples will be taken from the 5-ft split barrel. Samples will be taken from two intervals using a random number generator and will be taken at maximum depth. At each 5-ft interval selected for sampling (Table 7-4), one sample, which indicates the highest field screening for radioactivity, will be collected. If screening results are negative from any selected interval, a sample from the recovered section's midpoint will be collected. To complement the random sequence samples, soil/rocks samples which are from the recovered intervals and indicate contamination from field screening will be sent to the analytical laboratory for further analysis. At SWMU Nos. 35-003(e, f, g, m, and o), seven borehole locations were selected and samples from those borings will be sent to the laboratory for analysis (Figure 7-14).

SWMU No. 35-003 (Misc.) Surface and Subsurface Investigations

At SWMU No. 35-003(misc.), three boreholes will be drilled at locations over removed waste lines, selected using a random number generator with a 3-ft grid

TABLE 7-4

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE D

			Analyses Required *							
SWMU	SAMPLE NUMBER	DEPTH	Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
35-003 (e, f, g, m, and o)	D35-2016-B1	0-2 ft	1	1	1	1	**	1	1	0
	D35-2016-B2	15-20 ft	1	1	1	1	**	1	1	0
	D35-2016-B3	20-25 ft	1	1	1	1	**	1	1	0
	D35-2016-B4	25-30 ft	1	1	1	1	**	1	1	0
	D35-2017-B1	0-2 ft	1	1	1	1	**	1	1	0
	D35-2017-B2	15-20 ft	1	1	1	1	**	1	1	0
	D35-2017-B3	20-25 ft	1	1	1	1	**	1	1	0
	D35-2017-B4	25-30 ft	1	1	1	1	**	1	1	0
	D35-2018-B1	0-2 ft	1	1	1	1	**	1	1	0
	D35-2018-B2	15-20 ft	1	1	1	1	**	1	1	0
	D35-2018-B3	20-25 ft	1	1	1	1	**	1	1	0
	D35-2018-B4	25-30 ft	1	1	1	1	**	1	1	0
	D35-2019-B1	0-2 ft	1	1	1	1	**	1	1	0
	D35-2019-B2	15-20 ft	1	1	1	1	**	1	1	0
	D35-2019-B3	20-25 ft	1	1	1	1	**	1	1	0
	D35-2019-B4	25-30 ft	1	1	1	1	**	1	1	0
	D35-2020-B1	0-2 ft	1	1	1	1	**	1	1	0
	D35-2020-B2	15-20 ft	1	1	1	1	**	1	1	0
	D35-2020-B3	20-25 ft	1	1	1	1	**	1	1	0
	D35-2020-B4	25-30 ft	1	1	1	1	**	1	1	0
	D35-2021-B1	0-2 ft	1	1	1	1	**	1	1	0
	D35-2021-B2	15-20 ft	1	1	1	1	**	1	1	0
	D35-2021-B3	20-25 ft	1	1	1	1	**	1	1	0
	D35-2021-B4	25-30 ft	1	1	1	1	**	1	1	0
	D35-2022-B1	0-2 ft	1	1	1	1	**	1	1	0
	D35-2022-B2	15-20 ft	1	1	1	1	**	1	1	0
	D35-2022-B3	20-25 ft	1	1	1	1	**	1	1	0
	D35-2022-B4	25-30 ft	1	1	1	1	**	1	1	0
Rinsate Blanks			2	2	2	2	**	2	2	0
Bottle Blanks			0	0	0	2	**	2	2	0
Trip Blanks			0	0	0	0	**	0	0	0
Duplicates			2	2	2	2	**	2	2	0
TOTALS			32	32	32	34	0	34	34	0

*Section 5.0 ofthe Generic Quality Assurance (QA) Project Plan for RCRA Facility Investigations for the LANL ER Program (LANL 1991, 0843), Includes U.S. EPASolid Waste (SW) 846 quantitative and detection limits for the various required analytes.

** A discrete sample will be collected and analyzed for VOCs only if VOCs are first detected using the appropriate OVA, FID, or PID field instrument.

pattern (Figure 7-15 and Table 7-5). Information gathered from D&D activities will be used to locate the first set of holes at which contamination was previously found. These locations will be analyzed. Once asphalt is removed from selected locations, boring will be accomplished using a hollow-stem auger while a 5-ft split-barrel core sampler will continuously collect soil samples. At SWMU No. 35-003(h), a single sampling location will be developed (Figure 7-15). Samples will be taken from the boreholes at 2 locations (using a random number generator) plus in the first 2 ft of hole beneath the surface and at the last interval at maximum depth. The maximum depth for boreholes in SWMU No. 35-003(misc.) is 30 ft. Samples showing the highest contamination from radioactive field screening in recovered sections will be selected for analysis. If recovered sections indicate no contamination from field screening, a sample will be selected from the recovered section's midpoint. To complement the random samples, specimens which indicate the highest contamination from field screening from the recovered section will be sent to the laboratory for analysis.

SWMU No. 35-003(r) Surface and Subsurface Investigations

A detailed map of SWMU No. 35-003(r) will be developed during the engineering/ geodetic survey to show the major drainage channels, rills, gullies, seeps or wetlands, and rock falls. Where topography allows, surface samples will be gathered on a 100-ft by 100-ft grid. Detailed sampling of the sediment along drainage surfaces will be undertaken because these surfaces are the most likely transport pathways for contaminants. Radiation surveys using a scintillation detector will be conducted along the drainage surfaces to help locate potentially contaminated sources. Surface samples will be gathered to a depth of 6 in. using a stainless-steel or Teflon scoop. In addition, trenches across the drainage channels will be excavated at points in which sediments are deposited and topography allows. Trenches will be excavated using a decontaminated backhoe to approximately 18 in. and will be approximately 10 ft in length. A minimum of 3 grab samples will be gathered from each 6 in. of trench excavated using a Teflon or stainless-steel scoop.

If topography allows, two boreholes will be drilled in stream channels using methodology described for the preceding 35-003 sites (Figure 7-16). The results from the surface studies and topography will dictate the exact location. Modeling data indicate that COC plume maximum depths could be 650 ft. Five sampling intervals will be selected using a random number generator (Table 7-6). Samples will also be taken in the first 2 ft of each hole and at the total depth. In recovered sections, samples showing the highest contamination from field radioactive screening will be selected for analytical analysis. If no positive results are obtained from field screening, a sample will be collected from the recovered section's midpoint. To complement the samples taken at the prescribed intervals, samples will be collected from any sections indicating contamination from field screening techniques. Samples will be taken using wireline coring with a 5-ft barrel. Contaminant testing analysis will include the entire group of potential contaminants.

7.8.3 Sample Screening and Analysis

Each sample will be screened for contact radiation with a scintillation detector. All sample packages will be screened for surface contamination and contact radiation. Samples will be be **tested** for volatile organics (VOCs) (except surface samples) **using the appropriate OVA, FID, or PID field instrument. If VOCs are indicated,**

TABLE 7-5

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE D

			Analyses Required*							
SWMU	SAMPLE NUMBER	DEPTH	Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
35-003 (Misc.)	D35-2023-B1	0-2 ft	1	1	1	1	**	1	1	0
	D35-2023-B2	5-10 ft	1	1	1	1	**	1	1	0
	D35-2023-B3	20-25 ft	1	1	1	1	**	1	1	0
	D35-2023-B4	25-30 ft	1	1	1	1	**	1	1	0
	D35-2024-B1	0-2 ft	1	1	1	1	**	1	1	0
	D35-2024-B2	5-10 ft	1	1	1	1	**	1	1	0
	D35-2024-B3	20-25 ft	1	1	1	1	**	1	1	0
	D35-2024-B4	25-30 ft	1	1	1	1	**	1	1	0
	D35-2025-B1	0-2 ft	1	1	1	1	**	1	1	0
	D35-2025-B2	5-10 ft	1	1	1	1	**	1	1	0
	D35-2025-B3	20-25 ft	1	1	1	1	**	1	1	0
	D35-2025-B4	25-30 ft	1	1	1	1	**	1	1	0
	D35-2026-B1	0-2 ft	1	1	1	1	**	1	1	0
	D35-2026-B2	5-10 ft	1	1	1	1	**	1	1	0
	D35-2026-B3	20-25 ft	1	1	1	1	**	1	1	0
	D35-2026-B4	25-30 ft	1	1	1	1	**	1	1	0
	D35-2027-B1	0-2 ft	1	1	1	1	**	1	1	0
	D35-2027-B2	5-10 ft	1	1	1	1	**	1	1	0
	D35-2027-B3	20-25 ft	1	1	1	1	**	1	1	0
	D35-2027-B4	25-30 ft	1	1	1	1	**	1	1	0
Rinsate Blanks			1	1	1	1	**	1	1	0
Bottle Blanks			0	0	0	1	**	1	1	0
Trip Blanks			0	0	0	0	**	0	0	0
Duplicates			1	1	1	1	**	1	1	0
TOTALS			22	22	22	23	0	23	23	0

*Section 5.0 ofthe Generic Quality Assurance (QA) Project Plan for RCRA Facility Investigations for the LANL ER Program (LANL 1991, 0843), includes U.S. EPASolid Waste (SW) 846 quantitative and detection limits for the various required analytes.

** A discrete sample will be collected and analyzed for VOCs only if VOCs are first detected using the appropriate OVA, FID, or PID field instrument.

TABLE 7-6

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE D

			Analyses Required*							
SWMU	SAMPLE NUMBER	DEPTH	Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
35-003 (r)	D35-2028-B1	5-10 ft	1	1	1	1	**	1	1	0
	D35-2028-B2	10-15 ft	1	1	1	1	**	1	1	0
	D35-2028-B3	50-55 ft	1	1	1	1	**	1	1	0
	D35-2028-B4	130-135 ft	1	1	1	1	**	1	1	0
	D35-2028-B5	475-480 ft	1	1	1	1	**	1	1	0
	D35-2028-B6	515-520 ft	1	1	1	1	**	1	1	0
	D35-2028-B7	645-650 ft	1	1	1	1	**	1	1	0
	D35-2029-B1	0-2 ft	1	1	1	1	**	1	1	0
	D35-2029-B2	365-370 ft	1	1	1	1	**	1	1	0
	D35-2029-B3	375-380 ft	1	1	1	1	**	1	1	0
	D35-2029-B4	405-410 ft	1	1	1	1	**	1	1	0
	D35-2029-B5	420-425 ft	1	1	1	1	**	1	1	0
	D35-2029-B6	505-510 ft	1	1	1	1	**	1	1	0
	D35-2029-B7	645-650 ft	1	1	1	1	**	1	1	0
	D35-2030-A1	0-6 in.	1	1	1	1	**	1	1	0
	D35-2030-A2	6-12 in.	1	1	1	1	**	1	1	0
	D35-2030-A3	12-18 in.	1	1	1	1	**	1	1	0
	D35-2031-A1	0-6 in.	1	1	1	1	**	1	1	0
	D35-2031-A2	6-12 in.	1	1	1	1	**	1	1	0
	D35-2031-A3	12-18 in.	1	1	1	1	**	1	1	0
Rinsate Blanks			2	2	2	2	**	2	2	0
Bottle Blanks			0	0	0	2	**	2	2	0
Trip Blanks			0	0	0	0	**	0	0	0
Duplicates			2	2	2	2	**	2	2	0
TOTALS			24	24	24	26	0	26	26	0

*Section 5.0 ofthe Generic Quality Assurance (QA) Project Plan for RCRA Facility Investigations for the LANL ER Program (LANL 1991, 0843), includes U.S. EPASolid Waste (SW) 846 quantitative and detection limits for the various required analytes.

** A discrete sample will be collected and analyzed for VOCs only if VOCs are first detected using the appropriate OVA, FID, or PID field instrument.

then a discrete sample will be collected and analyzed for VOCs. Samples will also be analyzed for semivolatile organics (SVOCs); metals; gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy; and polychlorinated biphenyls (PCBs) (Tables 7-3 through 7-6).

7.9 SWMU Aggregate E, Phase I

SWMU No. 35-008 is a canyonside disposal area and is in the HSWA Module VIII (EPA 1990, 0306) (Table 1-1). The SWMU is located along the rim of Mortandad Canyon, north of the center portion of TA-35-85 (Figure 7-17). The debris in the disposal area is thought to include scrap metal and pipe, paint cans, a 55-gal drum, and miscellaneous building materials. Other debris includes concrete, asphalt, pipe reinforcing rods and soil. No documentation of any hazardous materials exists from this surface disposal area (LANL 1990, 0145). The SWMU is thought to extend from the canyon rim to the canyon floor.

7.9.1 Sampling Plan Rationale and Objectives

The objective of surface and subsurface characterization for SWMU No. 35-008 is to determine if contamination exists by collecting soil/rock data.

No evidence exists that D&D activity took place at SWMU No. 35-008. There is also no evidence that any hazardous materials were dumped at the site. If hazardous materials were dumped at this site, the most likely mechanism for movement is associated with hydrologic movement in the soil and vadose zone. Consistent with direction from the ER Program office, the most cost-effective and suitable way to address this type of SWMU is to remove debris and potentially contaminated soils through a VCA. Removal would then be followed by a Phase I investigation to confirm the presence or absence of contaminants.

A decision logic diagram for Phase I field investigation activity to be conducted at SWMU Aggregate E is presented in Figure 7-18 and discussed in the following text.

7.9.2 Phase I Field Investigation Activities

The Phase I sampling plans for SWMU No. 35-008 will include the engineering survey and environmental survey discussed in Section 7.4, geophysical surveys, surface and subsurface investigations (Figure 7-17). The geophysical survey will be conducted using electromagnetic and ground penetrating radar equipment to locate buried debris. A survey will also be conducted for potential VOCs.

The environmental and geophysical surveys will be conducted on a 10-ft grid to identify contaminated areas and debris. If contaminated areas are discovered during the environmental and geophysical surveys, near surface samples will be collected. Near surface sampling will be accomplished using a hand auger (power assisted if necessary) to collect samples to a depth of 2 ft. Samples will be collected at 6 in. intervals. In addition, two sampling locations will be selected at the toe of the debris slope (Figure 7-17). Samples will receive field screening for gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy; and VOC contamination. If debris is identified by the geophysical survey, a recommendation for removal of the debris, through implementation of a VCA, will be made. When the Laboratory has provided guidance for a VCA, soil will be surveyed for radioactivity and hazardous chemical contamination before and after removal, and debris will be checked for radioactivity and hazardous chemicals after removal.

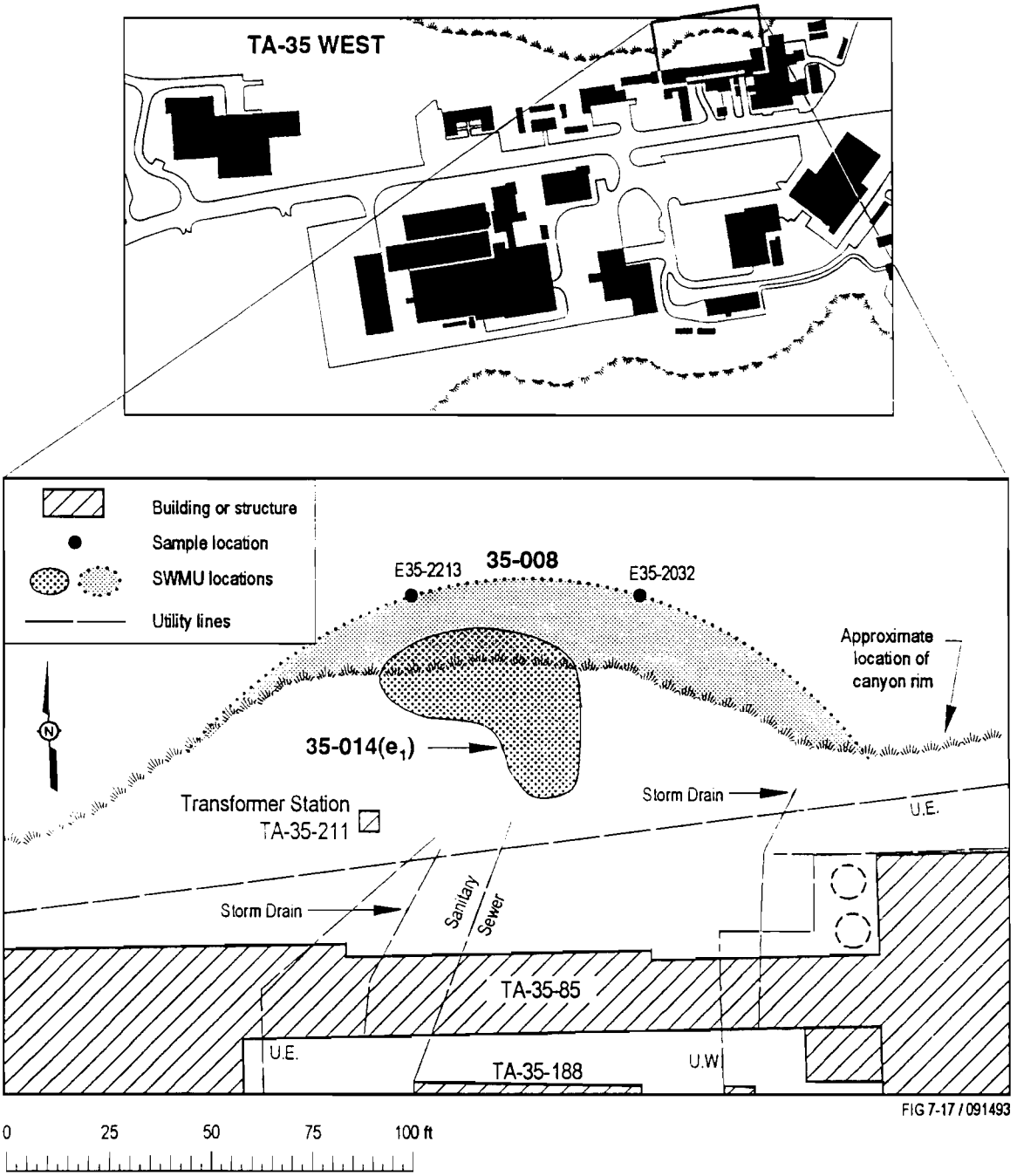


Figure 7-17. Schematic sample location map for SWMUs 35-008 and 35-014(e_1), Aggregate E.

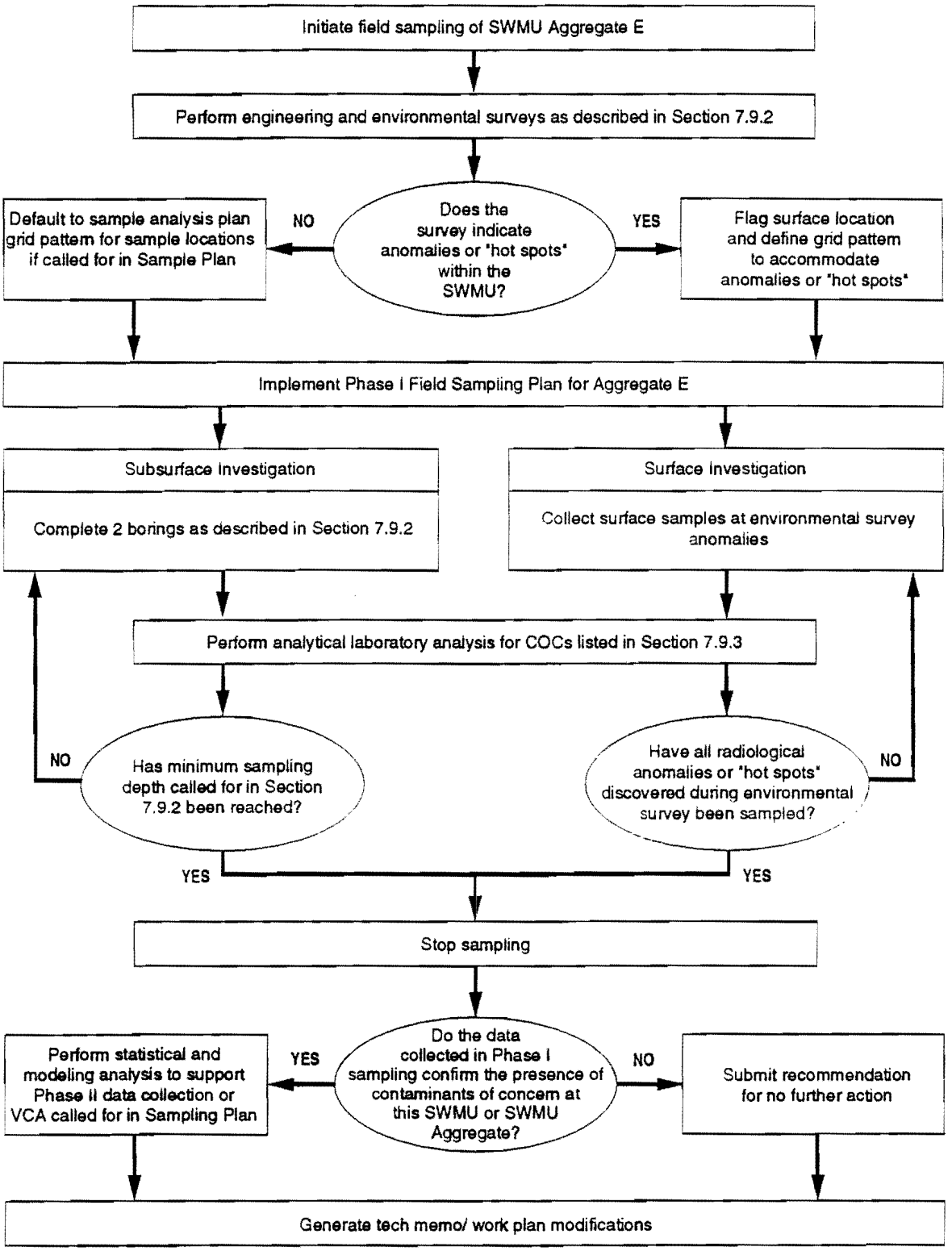


Figure 7-18. Decision logic for the sampling and analysis of SWMU Aggregate E.

7.9.3 Sample Screening and Analysis

Each sample collected will be screened for radiation using a scintillation detector. All sample packages will be screened for surface contamination and contact radiation. All samples will be analyzed for VOCs; SVOCs; metals; gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy; and PCBs (Table 7-7).

TABLE 7-7

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE E

			Analyses Required *							
SWMU	SAMPLE NUMBER	DEPTH	Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
35-008	E35-2213-A1	0-6 in.	1	1	1	1	1	1	1	0
	E35-2213-A2	6-12 in.	1	1	1	1	1	1	1	0
	E35-2213-A3	12-18 in.	1	1	1	1	1	1	1	0
	E35-2213-A4	18-24 in.	1	1	1	1	1	1	1	0
	E35-2032-A1	0-6 in.	1	1	1	1	1	1	1	0
	E35-2032-A2	6-12 in.	1	1	1	1	1	1	1	0
	E35-2032-A3	12-18 in.	1	1	1	1	1	1	1	0
	E35-2032-A4	18-24 in.	1	1	1	1	1	1	1	0
Rinsate Blanks			1	1	1	1	1	1	1	0
Bottle Blanks			0	0	0	1	1	1	1	0
Trip Blanks			0	0	0	0	1	0	0	0
Duplicates			1	1	1	1	1	1	1	0
TOTALS			10	10	10	11	12	11	11	0

*Section 5.0 ofthe Generic Quality Assurance (QA) Project Plan for RCRA Facility Investigations for the LANL ER Program (LANL 1991. 0843), includes U.S. EPASolid Waste (SW) 846 quantitative and detection limits for the various required analytes.

7.10 SWMU Aggregate F, Phase I

SWMU Aggregate F consists of SWMU Nos. 35-009 (a-d), which are four abandoned septic systems located around the perimeter of the eastern end of the mesa on which TA-35 is situated. All of these septic systems are listed in the HSWA Module VIII (Table 1-1) (in which they were formally designated SWMU Nos. 35-009[a-h]) (EPA 1990, 0306). The septic systems handled sanitary wastes from various laboratories at TA-35, and may have received, and released to the environment, a wide variety of industrial wastes, including radionuclides. Specific information concerning waste streams introduced to these septic systems is not available. Site characterizations or D&D activities have not been performed at these SWMUs. Figures 7-19 through 7-22 depict the location of these SWMUs. A detailed description of the site activities and history of these SWMUs within OU 1129 is found in Section 3.3, description of TA-35, Ten Site, of this Work Plan.

7.10.1 Sampling Plan Rationale and Objectives

The Phase I sampling plans for Aggregate F are designed to be implemented independently of (i.e., either before or after) the recommended VCA. In this investigation, sampling of subsurface soils and/or tuff beneath the septic tanks and leach fields will be conducted. Surface sampling will be performed at outfall locations if they are located during the engineering survey. Surface areas overlying the septic systems will be surveyed for radioactivity. Because no information is available that might limit suspected contaminants, all samples will be analyzed for a wide variety of COCs, metals, SVOCs, as well as gross-alpha, -beta, -gamma; gamma spectroscopy; and alpha spectroscopy.

The objective of this Phase I sampling plan is to determine the presence or absence of surface and subsurface contamination at the locations of the SWMUs. If contamination is confirmed to be present after the Phase I investigation, a Phase II investigation will be conducted to determine the nature and extent of contamination at the site. Sampling activities are biased toward areas in which residual contamination is expected on the basis of the following conceptual model for a release at this site:

- The waste stream is not known because a source for COCs has not been defined and significant amounts of contaminants are not expected at the site. Therefore, only 10% of the sample analyses will be conducted for a wide range of potential COCs. Results from these initial samples will then be used to structure the analytical suite for remaining sample locations. Table 7-8 indicates all anticipated analyses.

- Any remaining contaminant plumes may have moved vertically (along fracture planes that are in contact with the leach fields and outfalls).

- The grid patterns for outfall locations associated with this aggregate will be developed if contaminants are found during the environmental surveys and surface sampling.

The surface investigation at Aggregate F is designed primarily to answer the following decision points:

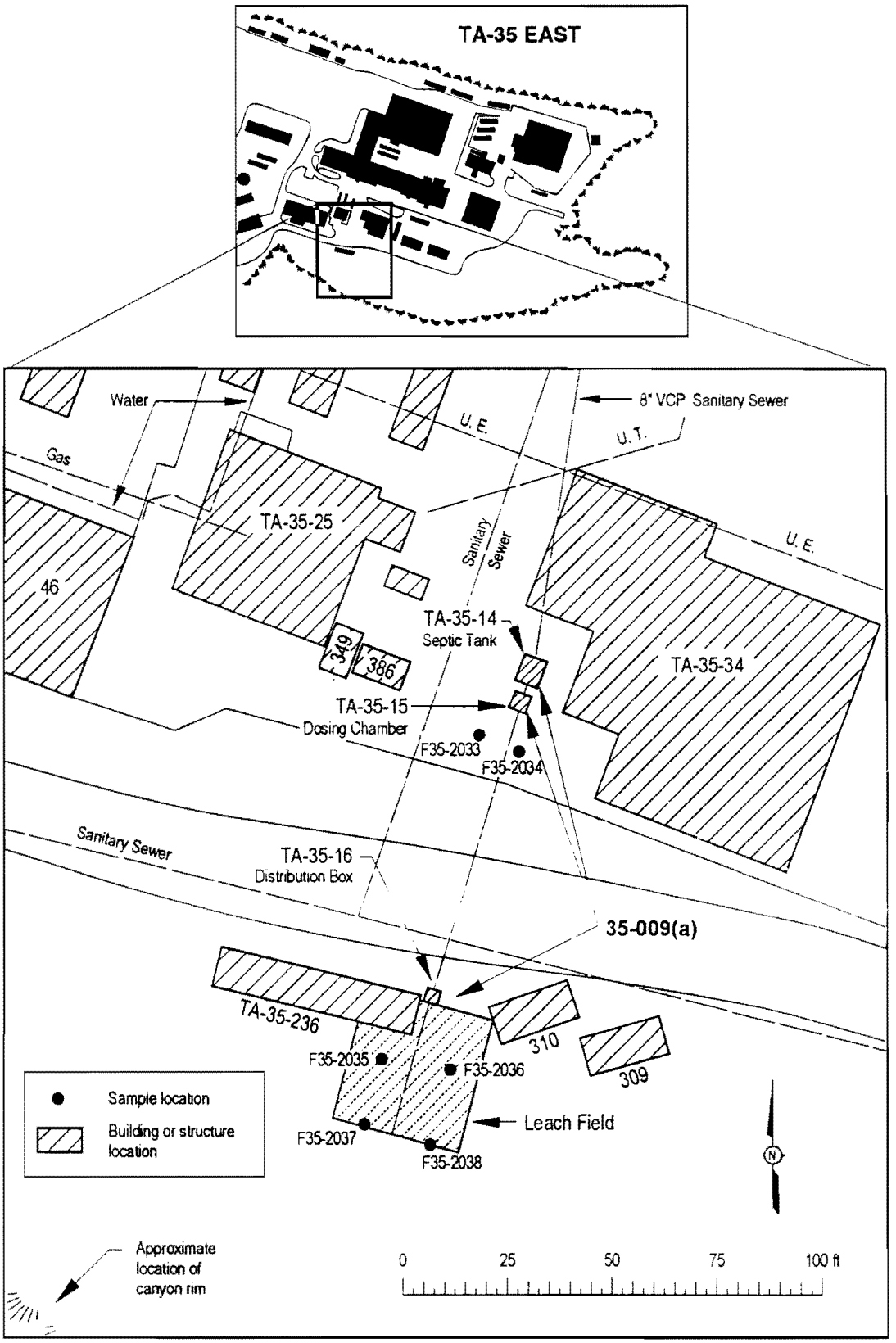


FIG 7-19 / 091493

LASL 1955 (ENG-R 1352, Sh. 2 of 2, Rev. 2); LANL 1986 (ENG-R 5117, Sh. 3 of 3, Rev. 23); JCI 1991

Figure 7-19. Schematic sample location map for SWMU 35-009(a), Aggregate F.

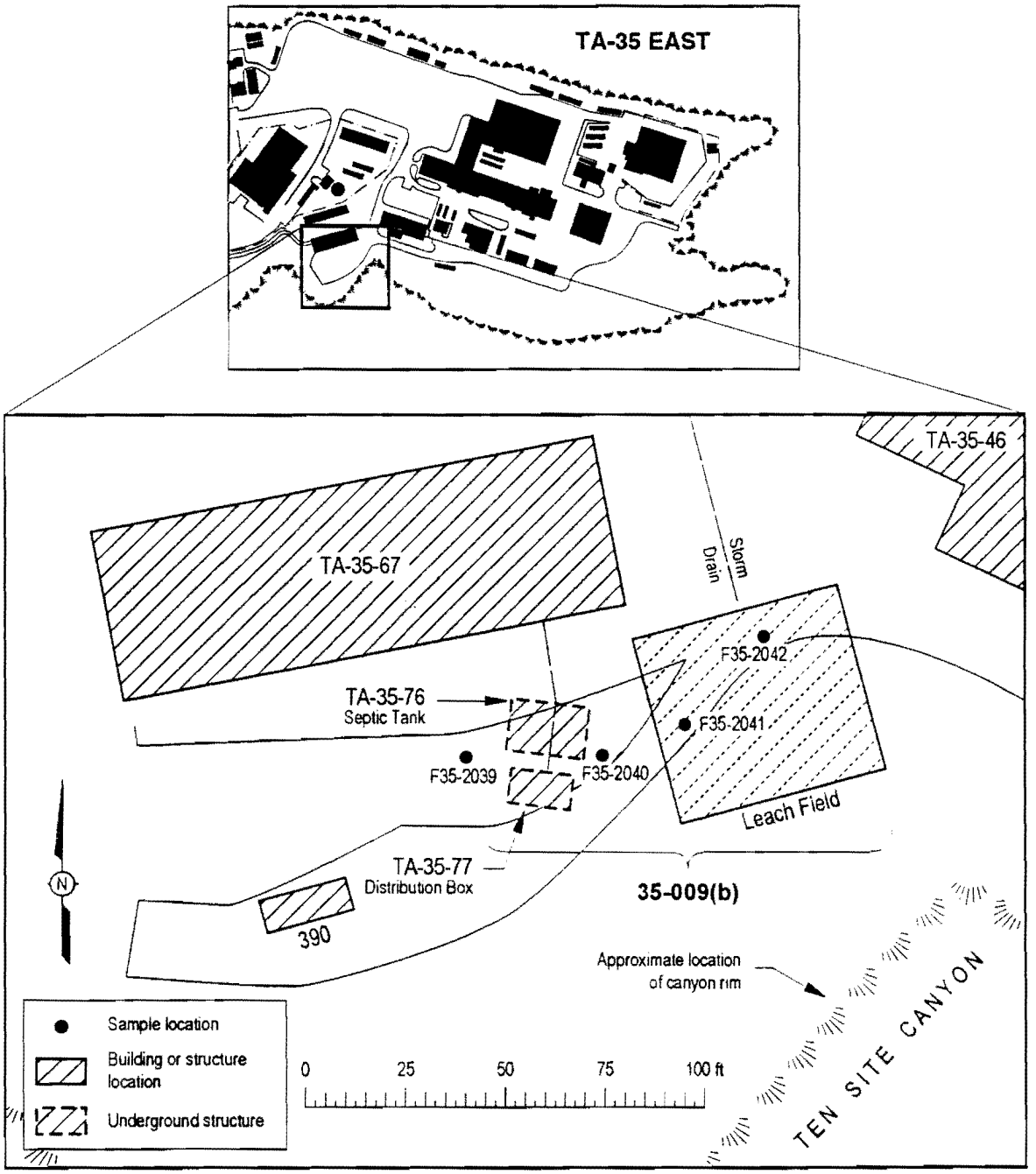


FIG 7-20 / 091493 LANL ENG-R 2462 (JCI 1991)

Figure 7-20. Schematic sample location map for SWMU 35-009(b), Aggregate F.

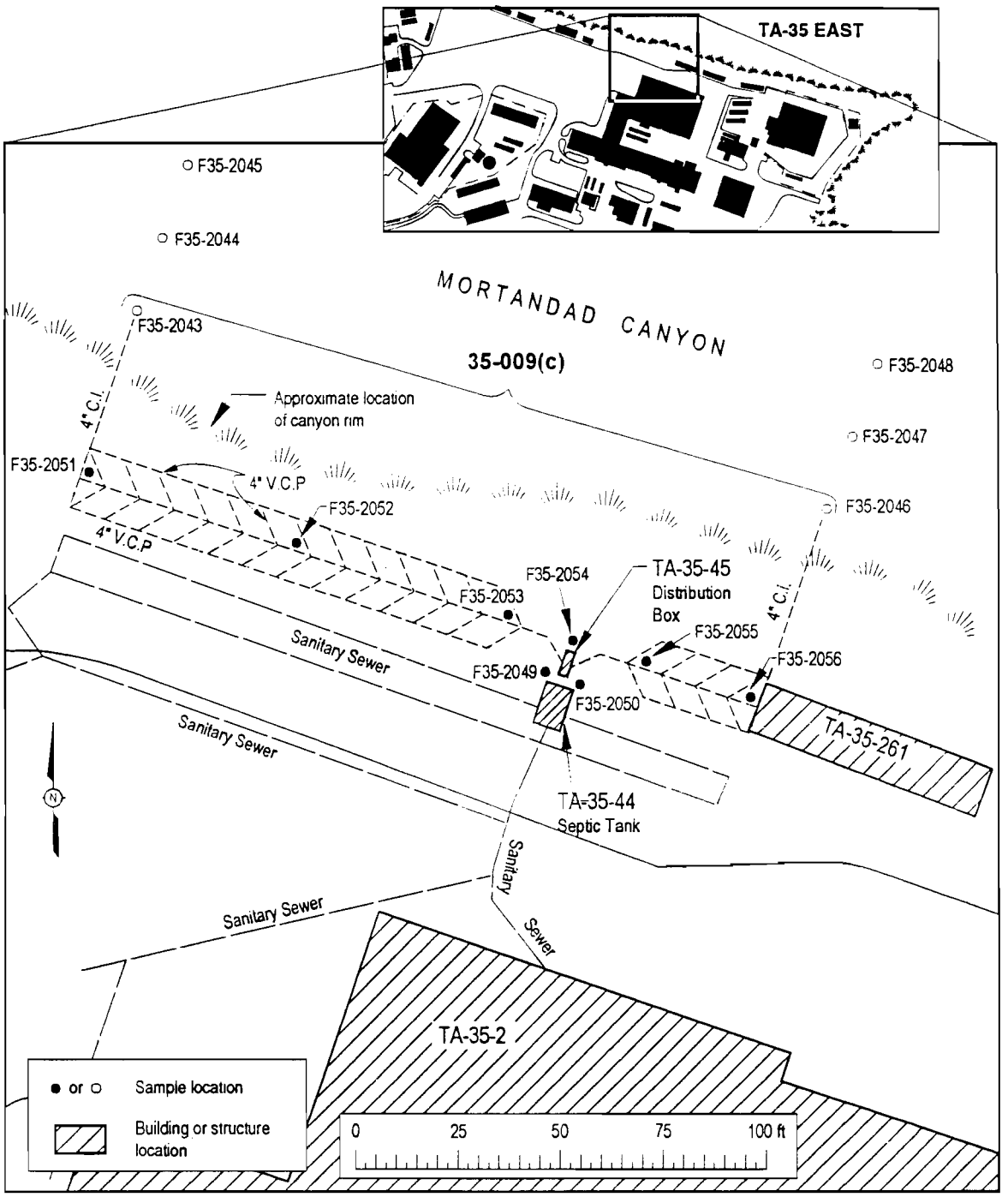


FIG 7-21 / 091493 LASL 1960 (ENG C-29305), JCI 1991

Figure 7-21. Schematic sample location map for SWMU 35-009(c), Aggregate F.

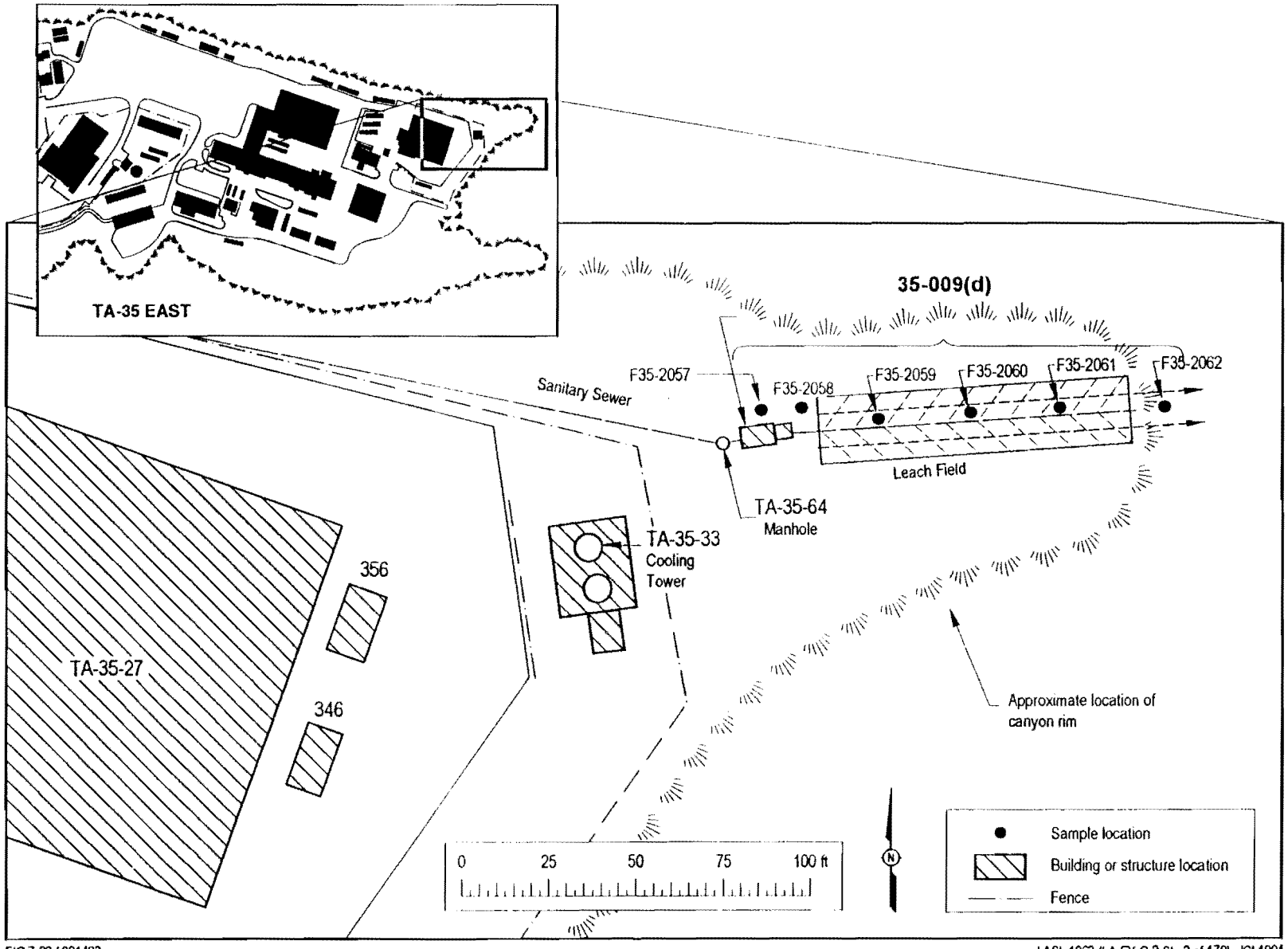


FIG 7-22 / 091493

LASL 1963 (LA-EY-C-2 Sh. 2 of 170), JCI 1991

Figure 7-22. Schematic sample location map for SWMU 35-009(d), Aggregate F.

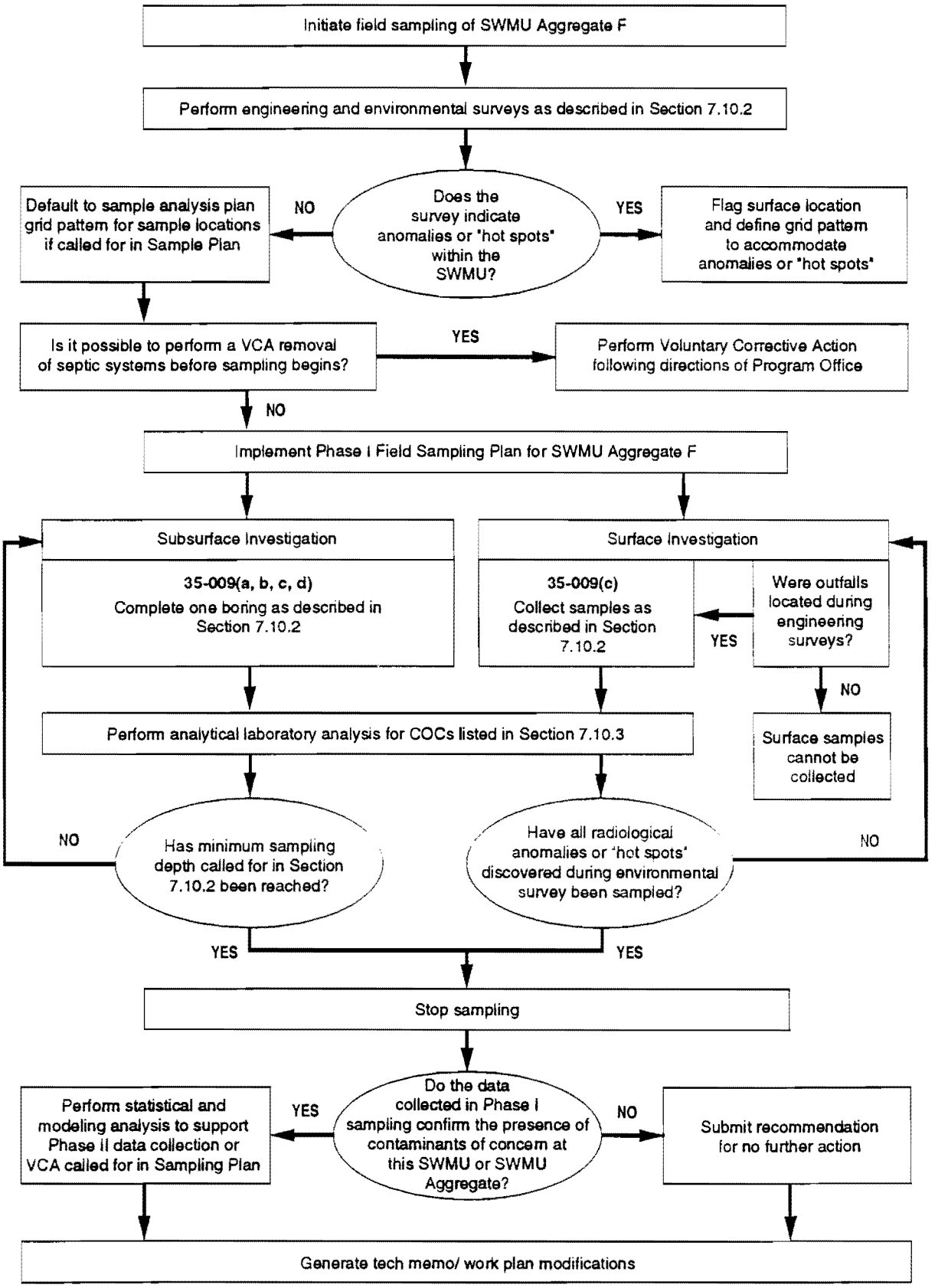


Figure 7-23. Decision logic for the sampling and analysis of SWMU Aggregate F.

TABLE 7-8

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE F

SWMU	SAMPLE NUMBER	DEPTH	Analyses Required *							
			Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
35-009 (a)	F35-2033-B1	5-10 ft	1	1	1	1	**	1	0	0
	F35-2033-B2	10-15 ft	1	1	1	1	**	1	0	0
	F35-2033-B3	15-20 ft	1	1	1	1	**	1	0	0
	F35-2034-B1	5-10 ft	1	1	1	1	**	1	0	0
	F35-2034-B2	10-15 ft	1	1	1	1	**	1	0	0
	F35-2034-B3	15-20 ft	1	1	1	1	**	1	0	0
	F35-2035-B1	0-5 ft	1	1	1	1	**	1	0	0
	F35-2035-B2	5-10 ft	1	1	1	1	**	1	0	0
	F35-2035-B3	10-15 ft	1	1	1	1	**	1	0	0
	F35-2035-B4	15-20 ft	1	1	1	1	**	1	0	0
	F35-2036-B1	0-5 ft	1	1	1	1	**	1	0	0
	F35-2036-B2	5-10 ft	1	1	1	1	**	1	0	0
	F35-2036-B3	10-15 ft	1	1	1	1	**	1	0	0
	F35-2036-B4	15-20 ft	1	1	1	1	**	1	0	0
	F35-2037-B1	0-5 ft	1	1	1	1	**	1	0	0
	F35-2037-B2	5-10 ft	1	1	1	1	**	1	0	0
	F35-2037-B3	10-15 ft	1	1	1	1	**	1	0	0
	F35-2037-B4	15-20 ft	1	1	1	1	**	1	0	0
	F35-2038-B1	0-5 ft	1	1	1	1	**	1	0	0
	F35-2038-B2	5-10 ft	1	1	1	1	**	1	0	0
	F35-2038-B3	10-15 ft	1	1	1	1	**	1	0	0
	F35-2038-B4	15-20 ft	1	1	1	1	**	1	0	0
35-009 (b)	F35-2039-B1	5-10 ft	1	1	1	1	**	1	0	0
	F35-2039-B2	10-15 ft	1	1	1	1	**	1	0	0
	F35-2039-B3	15-20 ft	1	1	1	1	**	1	0	0
	F35-2040-B1	5-10 ft	1	1	1	1	**	1	0	0
	F35-2040-B2	10-15 ft	1	1	1	1	**	1	0	0
	F35-2040-B3	15-20 ft	1	1	1	1	**	1	0	0
	F35-2041-B1	5-10 ft	1	1	1	1	**	1	0	0
	F35-2041-B2	10-15 ft	1	1	1	1	**	1	0	0
	F35-2041-B3	15-20 ft	1	1	1	1	**	1	0	0
	F35-2042-B1	0-5 ft	1	0	1	1	**	1	0	0
	F35-2042-B2	5-10 ft	1	1	1	1	**	1	0	0
	F35-2042-B3	10-15 ft	1	1	1	1	**	1	0	0
	F35-2042-B4	15-20 ft	1	1	1	1	**	1	0	0
35-009 (c)	F35-2043-S1	surface	1	1	1	1	0	1	0	0
	F35-2044-S1	surface	1	1	1	1	0	1	0	0
	F35-2045-S1	surface	1	1	1	1	0	1	0	0
	F35-2046-S1	surface	1	1	1	1	0	1	0	0
	F35-2047-S1	surface	1	1	1	1	0	1	0	0
	F35-2048-S1	surface	1	1	1	1	0	1	0	0
	F35-2049-B1	5-10 ft	1	1	1	1	1	1	0	0
	F35-2049-B2	10-15 ft	1	1	1	1	1	1	0	0
	F35-2049-B3	15-20 ft	1	1	1	1	1	1	0	0
	F35-2050-B1	5-10 ft	1	1	1	1	1	1	0	0
	F35-2050-B2	10-15 ft	1	1	1	1	1	1	0	0
	F35-2050-B3	15-20 ft	1	1	1	1	1	1	0	0
	F35-2051-B1	0-5 ft	1	1	1	1	1	1	0	0
	F35-2051-B2	5-10 ft	1	1	1	1	1	1	0	0
	F35-2051-B3	10-15 ft	1	1	1	1	1	1	0	0
	F35-2051-B4	15-20 ft	1	1	1	1	1	1	0	0
	F35-2052-B1	0-5 ft	1	1	1	1	1	1	0	0
	F35-2052-B2	5-10 ft	1	1	1	1	1	1	0	0
	F35-2052-B3	10-15 ft	1	1	1	1	1	1	0	0
	F35-2052-B4	15-20 ft	1	1	1	1	1	1	0	0

TABLE 7-8 (continued)

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE F

			Analyses Required *							
SWMU	SAMPLE NUMBER	DEPTH	Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
35-009 (c)	F35-2053-B1	0-5 ft	1	1	1	1	1	1	0	0
	F35-2053-B2	5-10 ft	1	1	1	1	1	1	0	0
	F35-2053-B3	10-15 ft	1	1	1	1	1	1	0	0
	F35-2053-B4	15-20 ft	1	1	1	1	1	1	0	0
	F35-2054-B1	0-5 ft	1	1	1	1	1	1	0	0
	F35-2054-B2	5-10 ft	1	1	1	1	1	1	0	0
	F35-2054-B3	10-15 ft	1	1	1	1	1	1	0	0
	F35-2054-B4	15-20 ft	1	1	1	1	1	1	0	0
	F35-2055-B1	0-5 ft	1	1	1	1	1	1	0	0
	F35-2055-B2	5-10 ft	1	1	1	1	1	1	0	0
	F35-2055-B3	10-15 ft	1	0	1	1	0	1	0	0
	F35-2055-B4	15-20 ft	1	1	1	1	1	1	0	0
	F35-2056-B1	0-5 ft	1	1	1	1	1	1	0	0
	F35-2056-B2	5-10 ft	1	1	1	1	1	1	0	0
	F35-2056-B3	10-15 ft	1	1	1	1	1	1	0	0
	F35-2056-B4	15-20 ft	1	1	1	1	1	1	0	0
35-009 (d)	F35-2057-B1	5-10 ft	1	1	1	1	1	1	0	0
	F35-2057-B2	10-15 ft	1	1	1	1	1	1	0	0
	F35-2057-B3	15-20 ft	1	1	1	1	1	1	0	0
	F35-2058-B1	5-10 ft	1	1	1	1	1	1	0	0
	F35-2058-B2	10-15 ft	1	1	1	1	1	1	0	0
	F35-2058-B3	15-20 ft	1	1	1	1	1	1	0	0
	F35-2059-B1	0-5 ft	1	1	1	1	1	1	0	0
	F35-2059-B2	5-10 ft	1	1	1	1	1	1	0	0
	F35-2059-B3	10-15 ft	1	1	1	1	1	1	0	0
	F35-2059-B4	15-20 ft	1	1	1	1	1	1	0	0
	F35-2060-B1	0-5 ft	1	1	1	1	1	1	0	0
	F35-2060-B2	5-10 ft	1	1	1	1	1	1	0	0
	F35-2060-B3	10-15 ft	1	1	1	1	1	1	0	0
	F35-2060-B4	15-20 ft	1	1	1	1	1	1	0	0
	F35-2061-B1	0-5 ft	1	1	1	1	1	1	0	0
	F35-2061-B2	5-10 ft	1	1	1	1	1	1	0	0
	F35-2061-B3	10-15 ft	1	1	1	1	1	1	0	0
	F35-2061-B4	15-20 ft	1	1	1	1	1	1	0	0
	F35-2062-B1	0-5 ft	1	1	1	1	1	1	0	0
	F35-2062-B2	5-10 ft	1	1	1	1	1	1	0	0
	F35-2062-B3	10-15 ft	1	1	1	1	1	1	0	0
	F35-2062-B4	15-20 ft	1	1	1	1	1	1	0	0
Rinsate Blanks			5	5	5	5	5	5	0	0
Bottle Blanks			5	5	5	5	5	5	0	0
Trip Blanks			0	0	0	0	1	0	0	0
Duplicates			5	5	5	5	5	5	0	0
TOTALS			108	106	108	108	67	108	0	0

*Section 5.0 ofthe Generic Quality Assurance (QA) Project Plan for RCRA Facility Investigations for the LANL ER Program (LANL 1991, 0843), includes U.S. EPASolid Waste (SW) 846 quantitative and detection limits for the various required analytes.

** A discrete sample will be collected and analyzed for VOCs only if VOCs are first detected using the appropriate OVA, FID, or PID field instrument.

1) Does surface and subsurface contamination currently exist in Aggregate F?

2) Are there any near-surface artifacts remaining that represent potential contaminant release points?

3) What is the potential for surface and subsurface migration of contaminants?

4) What are the current waste stream constituents?

Decision logic for Phase I field investigation activities to be conducted at SWMU Aggregate F is presented in Figure 7-23 and discussed in the following text.

7.10.2 Phase I Field Investigation Activities

The technical approach for the Phase I investigation in Aggregate F will consist of four tasks at each site. These tasks include the engineering survey and environmental survey discussed earlier in Section 7.4; subsurface sampling of the septic tank drain field and leach field areas; and surface sampling of the outfall areas.

The engineering survey will locate septic tanks, dosing chambers, distribution boxes, leach fields, drain fields, and outfalls at each site. A sampling grid will not be established at these sites because most subsurface structure locations are well documented in as-built engineering drawings, and the areal extent of each site is minimal. Following the engineering survey, a radiation survey will be conducted at the septic tank locations to identify potential radiological anomalies in the area and to aid in health and safety protection of personnel. Stationary radiological counts for a duration of one minute will be measured with a FIDLER over each septic tank location, near the center of each leach or drain field, and at any areas determined to have radiological anomalies. Any anomalous areas will be flagged in the field and marked on the base maps as sites for additional sample collection.

Site assessment at each of these SWMUs should, if possible, be preceded by a VCA to remove all equipment associated with each septic system. Specific methods for removal are not described in this sampling plan but will be conducted in compliance with Laboratory guidance for VCAs. In general, however, the VCA should accomplish the following objectives:

- The areas should be surveyed for radioactivity and hazardous chemical contamination before, during, and after the removal procedure.

- Septic tanks, dosing chambers, distribution boxes, and all associated piping and equipment should be removed.

- Contaminated soils, as indicated by surveys or sampling, should be excavated.

- Soil samples should be collected at the bases of the excavated pits to confirm that removal of contaminated media is complete.

Collected data can be used to design further environmental investigations, if necessary, or to support recommendations of NFA required if COCs are not encountered during the VCA.

Regardless of whether VCAs have been implemented, Phase I investigations will be conducted at each site to determine if COCs have been released. The sampling effort will assess subsurface contamination beneath septic tanks and leach or drain fields, and collect surface soil samples along the discharge drainage flow paths beneath outfalls, when outfalls are located. The following discussion on subsurface and surface sampling procedures is applicable to septic systems at all four sites (SWMU Nos. 35-009[a-d]).

SWMU Nos. 35-009(a-d) – Surface Investigations

For SWMU No. 35-009(c), engineering drawings indicate two outfalls, located at the west and east ends of the leach field (Figure 7-21). For the other sites addressed in this plan (SWMU Nos. 35-009[a, b, and d]), either outfalls do not exist or their locations are unknown. An attempt will be made to locate outfalls from these systems during initial engineering surveys. All outfall sites located during the engineering surveys will be screened with a scintillation detector to locate the drainage paths. The soil and rock in these areas will be investigated for evidence of drainage channeling. The objective of the Phase I surface investigation is to identify the former outfall locations and to ascertain the presence of residual contamination along the trace of the outfalls from the mesa top to the toe of the slope (Figure 7-21).

If a former outfall is located during the field surveys, three surface soil/rock samples will be collected from the drainage pathway immediately beneath the outfall. Surface sample locations will be selected in the field on the basis of detectable concentrations of above-background radioactivity measurements obtained during the environmental surveys. If no anomalies are found, sample locations will be located at 20-ft intervals beginning at the outfall discharge point, as indicated in Figure 7-21. Samples will either be collected with a stainless-steel trowel, **0-6 in.**, for soil or with a hammer and chisel for rock chip samples (see Appendix B for sampling procedures). Collected surface samples will be analyzed for the metals; SVOCs; gross-alpha, -beta, -gamma; gamma spectrometry; and alpha spectroscopy (Table 7-8). VOCs will not be analyzed because of rapid volatilization which occurs at the surface.

SWMU Nos. 35-009(a-d) – Subsurface Investigations

Soil boring locations will be selected as shown in Figures 7-19 through 7-22. The purpose of the soil borings is to assess potential subsurface contamination beneath the septic tanks and leach or drain fields associated with SWMU Nos. 35-009(a-d). Additional boreholes will be installed at areas with anomalous radiological or VOC readings, as identified during the environmental surveys. If no anomalies are detected, a total of 24 soil borings will be installed to a minimum depth of 20 ft using a decontaminated continuous 5-ft core barrel. As the 5-ft sections of core are retrieved from the borehole using a wire line, the soil and/or rock will be screened with a scintillation detector and photo ionization detector. Screening measurements will be recorded on the field log. Soil will be sampled from intervals with the greatest above-background contamination. Samples should be collected from each core interval (0-5 ft, 5-10 ft, 10-15 ft, and 15-20 ft) at boreholes in leach fields. For boreholes near tanks, samples should be collected beginning with the second core interval (5-10 ft, 10-15 ft, and 15-20 ft). If surveys indicate the presence of VOCs or above-background radioactivity, samples will be collected from points of highest readings. If no above-background contamination is detected, the midpoint of each core interval will be sampled.

If contamination is found in the last core interval (15-20 ft), the borings will continue in 5-ft intervals until two intervals below which above-background measurements are no longer detected. Appendix B contains the procedures for decontaminating sampling and drilling equipment, and for collecting soil and rock samples with a split-barrel core.

Collected subsurface samples will be screened for radioactivity and submitted to the laboratory for analysis. **The samples from each SWMU will be analyzed** for SVOCs; gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy; and metals (Table 7-8). **The samples from SWMU Nos. 35-009(c and d) will be analyzed for VOCs. SWMU Nos. 35-009(a and b) will be tested for VOCs using the appropriate OVA, FID, or PID field instruments. If VOCs are indicated, then a discrete sample will be collected and analyzed for VOCs.**

SWMU No. 35-009(a) – Subsurface Investigation

SWMU No. 35-009(a) is located on the southwest side of TA-35-34 and consists of a 1,500-gal. septic tank TA-35-14, dosing chamber TA-35-15, distribution box TA-35-16, and a leach field located near the mesa edge (Figure 7-19). The system may also have included an outfall on the south rim of the mesa to Ten Site Canyon (LANL 1990, 0145), but available engineering drawings and field walkovers have not confirmed its existence to date. The system served TA-35-2, the main laboratory, and office building at TA-35, between 1951 and 1975.

Six boreholes will be drilled to investigate potential subsurface contamination at SWMU No. 35-009(a). To assess potential leakage from the septic tank and dosing chamber two soil borings **(F35-2033 and F35-2034)** will be drilled approximately 10 ft apart and 10 ft downslope from the dosing chamber (Figure 7-19). (Note: If the tank and dosing chamber are removed as a VCA before sampling begins and no contaminated soils are encountered around the structures, **these boreholes** will not be drilled.) To assess potential contamination beneath the leach field, four soil borings **(F35-2035, F35-2036, F35-2037, and F35-2038)** will be drilled on the south side of trailer TA-35-236. Borings **F35-2035 and F35-2036** will be drilled approximately 15 ft apart and 10 ft from the trailer; borings **F35-2037 and F35-2038** will be drilled approximately 15 ft apart and 25 ft south of the trailer (Figure 7-19). Additional borings may be installed if areas with above-background radiation or detectable VOC concentrations are identified during the environmental surveys.

If an outfall from this septic system is located during the field surveys, three surface soil/rock samples will be collected from the discharge drainage pathway beneath the outfall either at locations of radiation or VOC anomalies; if no anomalies are found, the samples will be collected at 20-ft intervals measured from the outfall discharge point.

SWMU No. 35-009(b) – Subsurface Investigation

SWMU No. 35-009(b) is located on the southeast side of warehouse TA-35-67 and consists of septic tank TA-35-76, distribution box TA-35-77, and a leach field near the mesa edge (Figure 7-20). The exact location of the leach field is uncertain, but a 1965 aerial photograph shows a rectangular area of disturbed soil which is believed to represent the leach field on the east side of the septic tank (Figure 7-20). An outfall

may have discharged overflow from the system into Ten Site Canyon, but the existence of the outfall has not been confirmed by engineering drawings or field walkovers. This septic system served TA-35-67 and possibly other buildings between 1966 and 1975. No documentation exists regarding the types of materials released to this system.

Four boreholes will be drilled at this site to assess potential subsurface contamination at SWMU No. 35-009(b). Two boreholes **(F35-2039 and F35-2040)** will be drilled on either side of the septic tank (TA-35-76) to assess potential leakage from the tank and distribution box (Figure 7-20). The exact locations of these holes will depend on rig access, which is limited because of the steep slope in the area. (Note: If the tank and distribution box are removed as a VCA before sampling begins and no contaminated soils are encountered around these structures, **these boreholes** will not be drilled.) To investigate possible contamination in the leach field area, two borings **(F35-2041 and F35-2042)** will be drilled beneath the asphalt near the guard rail at the canyon edge (Figure 7-20). Although most of the leach field is south of the guard rail, the steep slope and thick vegetation prevent drilling in that area.

If an outfall from this septic system is located during the field surveys, three surface soil/rock samples will be collected from the discharge drainage pathway beneath the outfall either at locations of radiation or VOC anomalies; if no anomalies are found, the samples will be collected at 20-ft intervals measured from the outfall discharge point.

SWMU No. 35-009(c) – Subsurface Investigation

SWMU No. 35-009(c) is located on the north edge of the mesa near Mortandad Canyon on the north side of TA-35-2 (Figure 7-21). The system consists of a 1,290-gal. septic tank TA-35-44, distribution box TA-35-45, and an extensive leach field that underlies the dirt access road west of trailer TA-35-261 (Figure 7-21). Overflow from the system was discharged into Mortandad Canyon from two outfalls located at the east and west ends of the leach field (Figure 7-21). The system served TA-35-2 between 1961 and 1990.

Potential subsurface contamination at this site will be assessed by drilling eight soil borings. Two borings **(F35-2049 and F35-2050)** will be drilled to assess leakage from the tank; **F35-2049** will be installed 5 ft west of the distribution box and **F35-2050** will be installed 5 ft east of the distribution box (Figure 7-21). (Note: If the tank and distribution box are removed as a VCA before sampling begins and no contaminated soils are encountered around the structures, these boreholes will not be drilled.) Six boreholes **(F35-2051, F35-2052, F35-2053, F35-2054, F35-2055, and F35-2056)** will be drilled in the dirt road to assess possible contamination beneath the leach field. The locations of these borings are shown in Figure 7-21. Additional borings may be installed if areas with above-background radiation or detectable VOC concentrations are identified during the environmental surveys.

Potential release of COCs from the two outfalls at SWMU No. 35-009(c) will be assessed by collecting three surface soil/rock samples from the discharge drainage pathway beneath each of the two outfalls for a total of six samples. These samples will be collected either at locations of radiation or VOC anomalies; if no anomalies are found, the samples will be collected at 20-ft intervals measured from the outfall discharge points (Figure 7-21).

SWMU No. 35-009(d) – Subsurface Investigation

SWMU No. 35-009(d) is located at the northeast corner of the mesa, east of cooling tower TA-35-33. This septic system served the Fast Reactor Core Test Building (TA-35-27) between 1966 and 1990. The system consists of a combination septic tank/dosing chamber (TA-35-65) and a leach field that underlies the dirt access road that extends eastward from the cooling tower into Ten Site Canyon (Figure 7-22). The 1990 SWMU report indicates that an outfall to Mortandad Canyon may be associated with this system (LANL 1990, 0145), but available engineering drawings and field walkovers have not confirmed its existence to date.

A total of six soil borings will be drilled at this site to investigate potential subsurface contamination. To assess possible leakage from the tank/dosing chamber, two borings **(F35-2057 and F35-2058)** will be drilled on the north side of TA-35-65 (Figure 7-22). Limited rig access space prevents borings from being drilled on the south side of this structure. (Note: If the tank/dosing chamber are removed as a VCA before sampling begins and no contaminated soils are encountered around the structure, these boreholes will not be drilled.) Four borings **(F35-2059, F35-2060, F35-2061, and F35-2062)** will be drilled in the dirt road to assess potential contamination beneath the leach field. The locations of these holes are shown in Figure 7-22. Additional boreholes may be installed if areas with above-background radiation or detectable VOC concentrations are identified during the environmental surveys.

If an outfall from this septic system is located during the field surveys three surface soil/rock samples will be collected from the discharge drainage pathway beneath the outfall either at locations of radiation or VOC anomalies; if no anomalies are found, the samples will be collected at 20-ft intervals measured from the outfall discharge point.

7.10.3 Sample Screening and Analysis

Each sample collected will be screened for contact radiation with a scintillation detector. All sample packages must be screened for surface contamination and contact radiation. All samples will be analyzed for SVOCs; metals; gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy; and tritium (soil). The subsurface soil samples collected from **SWMU Nos. 35-009(c and d)** will also be analyzed for VOCs. Table 7-8 outlines the total number of matrix and QA/QC samples required for this field investigation, the corresponding analyses, and sample requirements.

7.11 SWMU Aggregate G, Phase I

The sampling study area for SWMU Nos. 35-010(a-d) is shown in Figure 7-24. All of these SWMUs are listed in the HSWA Module VIII (EPA 1990, 0306) (Table 1-1). Three lagoons, SWMU Nos. 35-010(a, b, and c) were installed in 1975 and are still active. These lagoons have concrete sides and bentonite-lined bottoms. The filter pit, SWMU No. 35-010(d), was constructed in 1980 and is lined with plastic. The lagoons are located in Ten Site Canyon near the confluence of the small feeder stream located in SWMU No. 35-003(r) and the Ten Site Canyon channel. The lagoons receive wastes which include sanitary waste, small quantities of radionuclides, solvents, acids, bases, and photo-processing wastes from TAs-35, -48, -50, -55, and -64. It is not known if the lagoons and/or filters have released contaminants to the underlying soils/tuff or if possible hazardous substances have been released at the sand filter outfall. The outflows from the sand pits are monitored under an National Pollutant Discharge Elimination System (NPDES) permit. The lagoons are scheduled for decommissioning when the Laboratory-wide Sanitary WasteWater System Consolidation (SWSC) waste lines become operational. Therefore, a limited Phase I investigation will be implemented and a more comprehensive execution of the sample plan will be coordinated with D&D activities.

7.11.1 Sampling Plan Rationale and Objectives

The conceptual model for the SWMU No. 35-010 aggregate is potentially leaking lagoons containing an unknown variety of hazardous materials. The site could have been contaminated before the construction of the lagoons by discharges from SWMU No. 35-003(r). The previous contamination will be difficult to distinguish from contamination by the lagoons, therefore, a detailed search (in coordination with D&D activities) upstream in Ten Site canyon will be conducted. Data gathered from SWMU No. 35-003(r) (directly upstream from lagoons) will be used to supplement that collected from SWMU No. 35-010 for analysis.

The focus of Phase I will be the analysis of the material in the lagoons and drill samples collected from under the lagoons to see if the lagoons are discharging into soil/rock directly beneath the bentonite base.

A decision logic diagram for Phase I field investigation activities to be conducted at SWMU Aggregate G is presented in Figure 7-25 and discussed in the following text.

7.11.2 Phase I Field Investigation Activities

The technical approach for the Phase I investigation in Aggregate G will consist of four tasks. These tasks include the engineering survey and environmental surveys discussed in Section 7.4, liquid/sludge sampling, and subsurface investigation.

Liquid/Sludge Sample Collection

Two locations in each lagoon will be selected for collection of liquid/sludge samples. Each sample will be collected 38 ft from each end of the two lagoons on the south and 80 ft from each end along the axis of the lagoon on the north (Figure 7-24). Two samples will be collected at each location. Samples will be collected at 1 ft and 3 ft below the liquid surface by using a weighted bottle sampler. A second set of samples

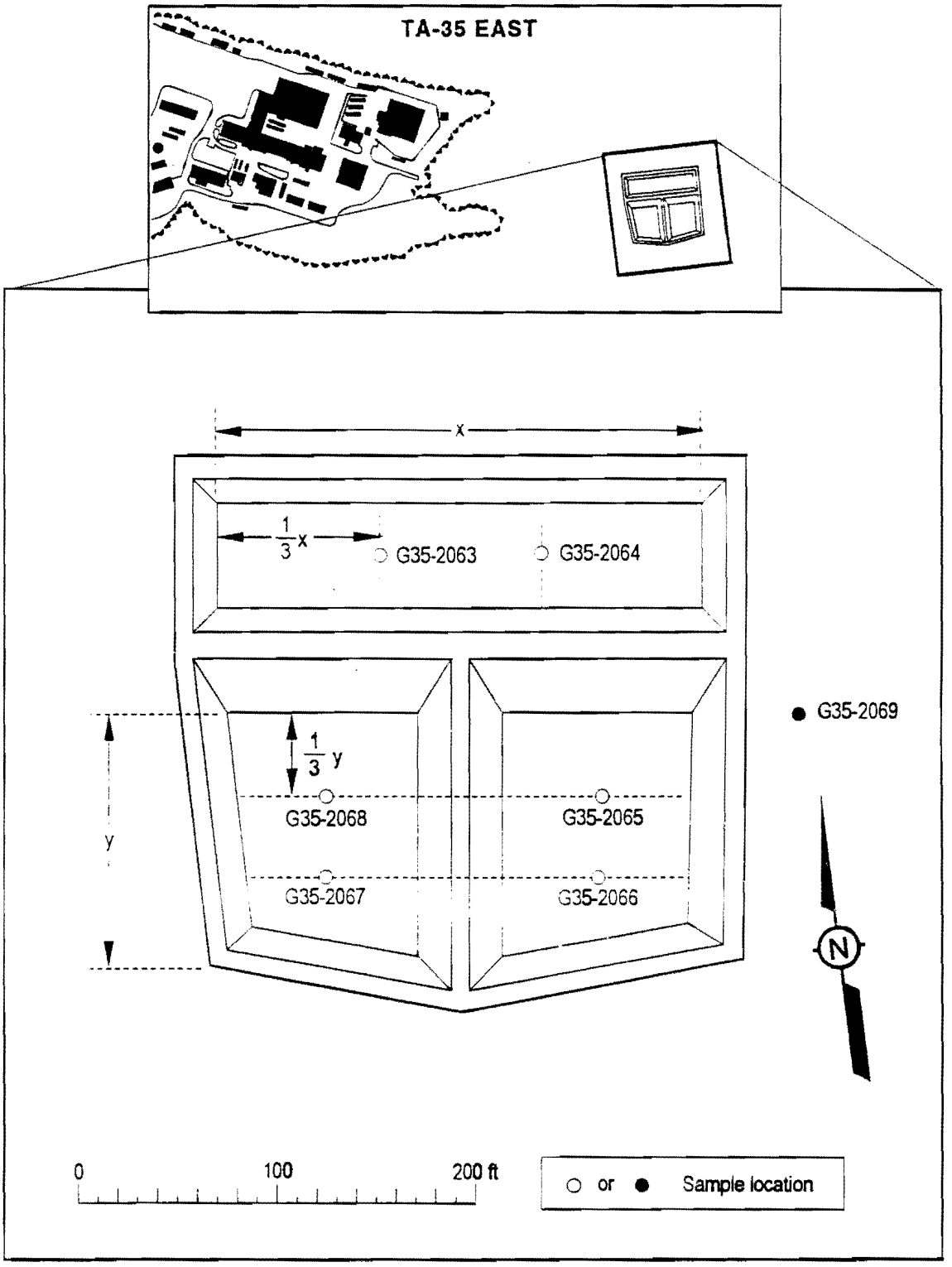


FIG 7-24 / 091493 Pan Am utilities map

Figure 7-24. Schematic sample location map for SWMUs 35-010 (a through c), Aggregate G.

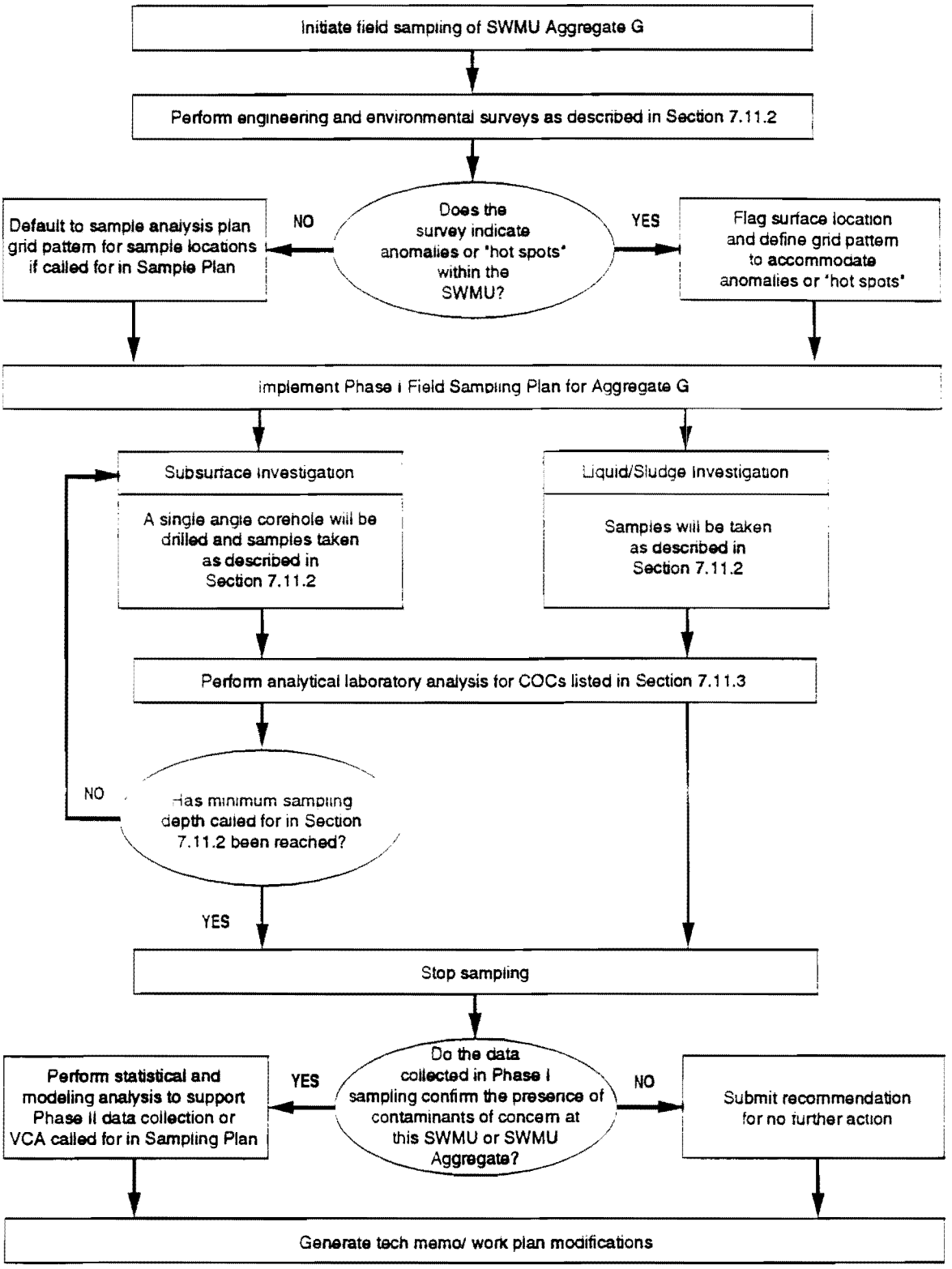


Figure 7-25. Decision logic for the sampling and analysis of SWMU Aggregate G.

will be collected from the top and base of the sludge using a grab sample. The liquid and sludge samples will be analyzed for VOCs; SVOCs; PCBs; metals; gross-alpha, -beta, -gamma; gamma spectrometry; and alpha spectroscopy (Table 7-9).

Subsurface Investigation

A single hole will be drilled using a wireline coring method at a 45 degree angle under the lagoons to try to intersect fractures and to determine if leakage is occurring. This hole will be continuously cored from the surface with samples being taken on 5-ft intervals. The hole will be a minimum depth of 50 ft. All samples will be field-screened for radioactive contaminants and VOCs. Samples indicating highest contamination will be sent to the laboratory for analysis. If no contamination is found, a random section of recovered material will be analyzed. Analysis will include testing for VOCs; SVOCs; PCBs; metals; gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy; and soil/rock moisture content (Table 7-9). The location of the hole will be surveyed and recorded into the NMSP Coordinate System and recorded on the site base map.

7.11.3 Sample Screening and Analysis

Each sample collected will be screened with a scintillation detector for contact radiation. All sample packages must be screened for surface contamination and contact radiation.

TABLE 7-9

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE G

SWMU	SAMPLE NUMBER	DEPTH	Analyses Required*								
			Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil	Moisture Content
35-010 (a)	G35-2063-G1	sludge (top)	1	1	1	1	1	1	1	0	1
	G35-2063-G2	sludge (bottom)	1	1	1	1	1	1	1	0	1
	G35-2063-W1	liquid (1 ft)	1	1	1	1	1	1	1	0	1
	G35-2063-W2	liquid (3 ft)	1	1	1	1	1	1	1	0	1
	G35-2064-G1	sludge (top)	1	1	1	1	1	1	1	0	1
	G35-2064-G2	sludge (bottom)	1	1	1	1	1	1	1	0	1
	G35-2064-W1	liquid (1 ft)	1	1	1	1	1	1	1	0	1
	G35-2064-W2	liquid (3 ft)	1	1	1	1	1	1	1	0	1
35-101 (b)	G35-2065-G1	sludge (top)	1	1	1	1	1	1	1	0	1
	G35-2065-G2	sludge (bottom)	1	1	1	1	1	1	1	0	1
	G35-2065-W1	liquid (1 ft)	1	1	1	1	1	1	1	0	1
	G35-2065-W2	liquid (3 ft)	1	1	1	1	1	1	1	0	1
	G35-2066-G1	sludge (top)	1	1	1	1	1	1	1	0	1
	G35-2066-G2	sludge (bottom)	1	1	1	1	1	1	1	0	1
	G35-2066-W1	liquid (1 ft)	1	1	1	1	1	1	1	0	1
	G35-2066-W2	liquid (3 ft)	1	1	1	1	1	1	1	0	1
35-010 (c)	G35-2067-G1	sludge (top)	1	1	1	1	1	1	1	0	1
	G35-2067-G2	sludge (bottom)	1	1	1	1	1	1	1	0	1
	G35-2067-W1	liquid (1 ft)	1	1	1	1	1	1	1	0	1
	G35-2067-W2	liquid (3 ft)	1	1	1	1	1	1	1	0	1
	G35-2068-G1	sludge (top)	1	1	1	1	1	1	1	0	1
	G35-2068-G2	sludge (bottom)	1	1	1	1	1	1	1	0	1
	G35-2068-W1	liquid (1 ft)	1	1	1	1	1	1	1	0	1
	G35-2068-W2	liquid (3 ft)	1	1	1	1	1	1	1	0	1
	G35-2069-B1	0-5 ft	1	1	1	1	1	1	1	0	1
	G35-2069-B2	5-10 ft	1	1	1	1	1	1	1	0	1
	G35-2069-B3	10-15 ft	1	1	1	1	1	1	1	0	1
	G35-2069-B4	15-20 ft	1	1	1	1	1	1	1	0	1
	G35-2069-B5	20-25 ft	1	1	1	1	1	1	1	0	1
	G35-2069-B6	25-30 ft	1	1	1	1	1	1	1	0	1
	G35-2069-B7	30-35 ft	1	1	1	1	1	1	1	0	1
	G35-2069-B8	35-40 ft	1	1	1	1	1	1	1	0	1
	G35-2069-B9	40-45 ft	1	1	1	1	1	1	1	0	1
	G35-2069-B10	45-50 ft	1	1	1	1	1	1	1	0	1
Rinsate Blanks			1	1	1	1	1	1	1	0	1
Bottle Blanks			0	0	0	1	1	1	1	0	1
Trip Blanks			0	0	0	0	1	0	0	0	0
Duplicates			1	1	1	1	1	1	1	0	1
TOTALS			36	36	36	37	38	37	37	0	37

*Section 5.0 ofthe Generic Quality Assurance (QA) Project Plan for RCRA Facility Investigations for the LANL ER Program (LANL 1991, 0843), includes U.S. EPASolid Waste (SW) 846 quantitative and detection limits for the various required analytes.

7.12 SWMU Aggregate H, Phase I

The location of SWMU Nos. 35-014(a and b) at the east end of TA-35 are shown in Figure 7-26. Both of these SWMUs are listed in the HSWA Module VIII (EPA 1990, 0306) (Table 1-1), but were formally listed as 35-014. This section of TA-35 is located on a finger mesa between Mortandad and Ten Site canyons. SWMU No. 35-014(a) is the site of radionuclide-contaminated soils affected by deposition of stack emissions. Environmental monitoring of peach trees in the vicinity of the exhaust stack shows that they contain radionuclides. SWMU No. 35-014(b) is the approximate site of a leaking drum that reportedly contained oil with 50.4 µg/g of PCBs. The leaking drum was found near the southwest corner of the northwest wing of TA-35-2; the exact original location of the drum is unknown.

According to archival information in Chapter 3.0, the waste stream for this aggregate contains radionuclides from the exhaust stack and PCBs from the leaking drum. The stack was used to exhaust, among other things, a tritium glovebox facility that operated in the basement of TA-35-2. The releases of several thousand curies of tritium to the atmosphere annually were reported between 1954 and 1979. The leaking oil drum may have contained PCBs. The drum was removed, but it is not known if all the surrounding contaminated material was removed. The release of oil containing 50.4 µg/g PCBs is documented to have occurred in 1985 (Scholl Fritz 1985, 04-0083).

7.12.1 Sampling Plan Rationale and Objectives

The objective of surface/near-surface characterization for this aggregate is to determine if contamination exists. The characterization process will generate the following sampling activities:

- Collecting soil/rock data to determine if contaminants exist.
- Collecting soil/rock data to support transport model calculations.

The conceptual model for this aggregate is as follows:

- The area in which releases have occurred (SWMU No. 35-014[a]) is heavily industrialized, and most of the area was covered with an asphalt cap before any known releases.
- A grass-covered and soil area surrounds portions of building TA-35-2 and is a likely location for contaminants. Soils in the grass area around TA-35-2 will be analyzed.
- The asphalt cap allows rainfall to wash the potential contaminants to outfall gutters. The soils beneath the gutters will be analyzed. The soils that receive moisture from the roof of TA-35-2 will also be analyzed.
- Soil at SWMU No. 35-014(b) will be analyzed for PCBs, which are thought to be localized at the spill sight.

A decision logic diagram for Phase I field investigation activities to be conducted at SWMU Aggregate H is presented in Figure 7-27 and discussed in the following text.

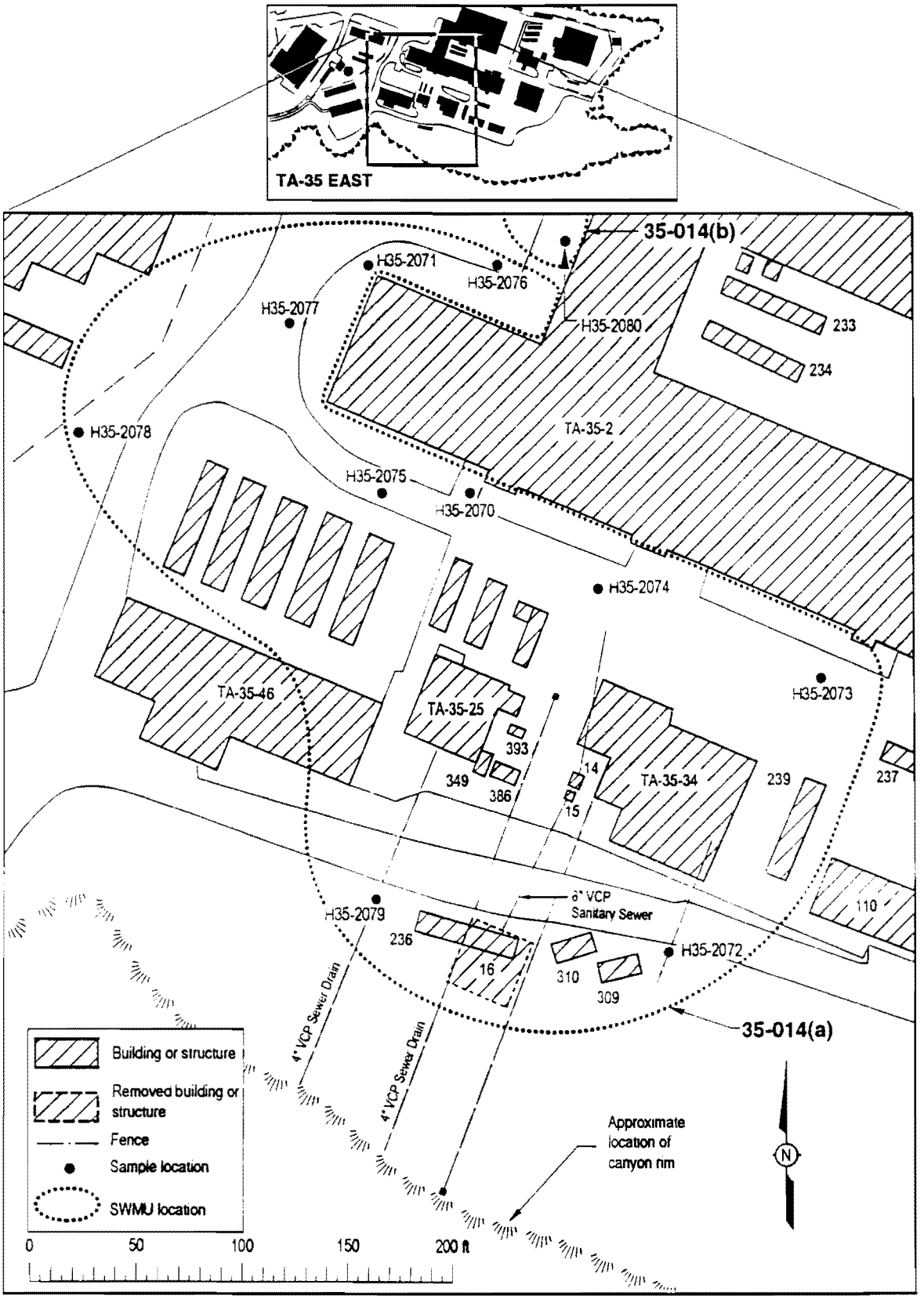


Figure 7-26. Schematic sample location map for SWMUs 35-014(a and b), Aggregate H.

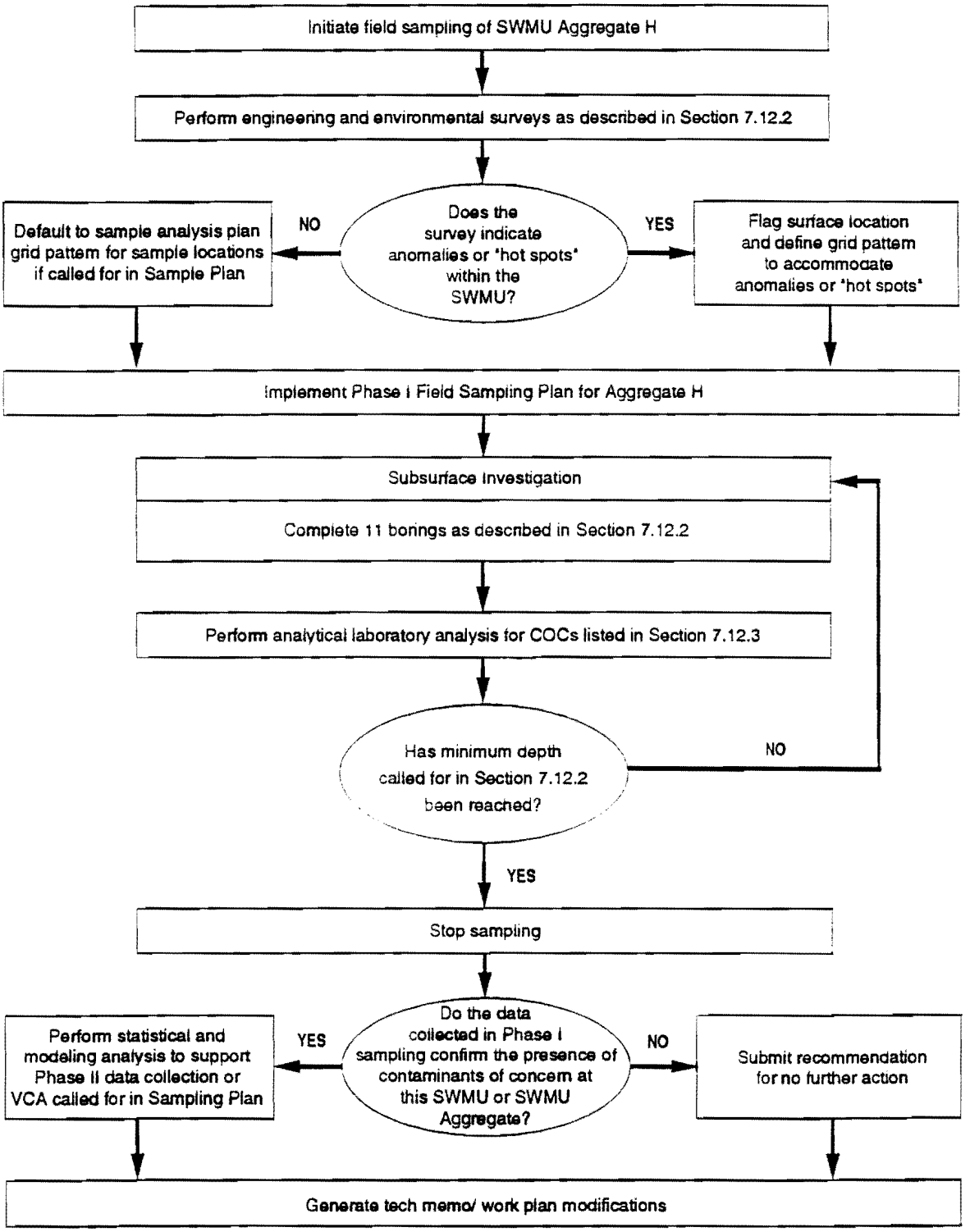


Figure 7-27 Decision logic for the sampling and analysis of SWMU Aggregate H.

7.12.2 Phase I Field Investigation Activities

The sampling plan is designed to locate potential contaminants at their source (Figure 7-26). AIRDOS models will be used to assist in the characterization process (see Appendix C). The field activities will include the engineering survey and environmental survey discussed in Section 7.4, and surface sampling. The radiological survey will be conducted between established sample location points to help guide surface sampling locations between grid points.

Eleven boreholes will be drilled into the grassy area on the south and west sides of TA-35-2 to a depth of 3 ft by a hand auger (power-assisted if necessary). Upon the retrieval of soils, the entire recovered section will be screened for radiation. One sample for each planned analysis will be collected in the area of soil with the highest observed radioactivity. If no observed radioactivity is found, samples from random locations in the recovered interval will be analyzed for radionuclides (Table 7-10). At location B-3 (SWMU No. 35-014[b]),samples will be analyzed for radionuclides and PCBs (Table 7-10). Boring will stop when field screen and field laboratory analyses indicate no contamination. Two additional 1-ft samples will be collected to confirm that no contamination exists.

7.12.3 Sample Screening and Analysis

Each sample will be screened with a scintillation detector for contact radiation. All sample packages will be screened for surface contamination and contact radiation. Samples gathered will be analyzed for PCBs (SWMU No. 35-014 [b]); gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy; and tritium in soil.

TABLE 7-10

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE H

			Analyses Required*							
SWMU	SAMPLE NUMBER	DEPTH	Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
35-014 (a)	H35-2070-A1	0-1 ft	1	1	1	0	0	0	0	1
	H35-2070-A2	1-2 ft	1	1	1	0	0	0	0	1
	H35-2070-A3	2-3 ft	1	1	1	0	0	0	0	1
	H35-2071-A1	0-1 ft	1	1	1	0	0	0	0	1
	H35-2071-A2	1-2 ft	1	1	1	0	0	0	0	1
	H35-2071-A3	2-3 ft	1	1	1	0	0	0	0	1
	H35-2080-A1	0-1 ft	1	1	1	0	0	0	0	1
	H35-2080-A2	1-2 ft	1	1	1	0	0	0	0	1
	H35-2080-A3	2-3 ft	1	1	1	0	0	0	0	1
	H35-2073-A1	0-1 ft	1	1	1	0	0	0	0	1
	H35-2073-A2	1-2 ft	1	1	1	0	0	0	0	1
	H35-2073-A3	2-3 ft	1	1	1	0	0	0	0	1
	H35-2074-A1	0-1 ft	1	1	1	0	0	0	0	1
	H35-2074-A2	1-2 ft	1	1	1	0	0	0	0	1
	H35-2074-A3	2-3 ft	1	1	1	0	0	0	0	1
	H35-2075-A1	0-1 ft	1	1	1	0	0	0	0	1
	H35-2075-A2	1-2 ft	1	1	1	0	0	0	0	1
	H35-2075-A3	2-3 ft	1	1	1	0	0	0	0	1
	H35-2076-A1	0-1 ft	1	1	1	0	0	0	0	1
	H35-2076-A2	1-2 ft	1	1	1	0	0	0	0	1
	H35-2076-A3	2-3 ft	1	1	1	0	0	0	0	1
	H35-2077-A1	0-1 ft	1	1	1	0	0	0	0	1
	H35-2077-A2	1-2 ft	1	1	1	0	0	0	0	1
	H35-2077-A3	2-3 ft	1	1	1	0	0	0	0	1
	H35-2078-A1	0-1 ft	1	1	1	0	0	0	0	1
	H35-2078-A2	1-2 ft	1	1	1	0	0	0	0	1
	H35-2078-A3	2-3 ft	1	1	1	0	0	0	0	1
	H35-2079-A1	0-1 ft	1	1	1	0	0	0	0	1
	H35-2079-A2	1-2 ft	1	1	1	0	0	0	0	1
	H35-2079-A3	2-3 ft	1	1	1	0	0	0	0	1
35-014 (b)	H35-2072-A1	0-1 ft	1	1	1	0	0	0	1	1
	H35-2072-A2	1-2 ft	1	1	1	0	0	0	1	1
	H35-2072-A3	2-3 ft	1	1	1	0	0	0	1	1
Rinsate Blanks			1	1	1	0	0	0	1	1
Bottle Blanks			0	0	0	0	0	0	1	0
Trip Blanks			0	0	0	0	0	0	1	0
Duplicates			1	1	1	0	0	0	1	1
TOTALS			35	35	35	0	0	0	7	35

*Section 5.0 ofthe Generic Quality Assurance (QA) Project Plan for RCRA Facility Investigations for the LANL ER Program (LANL 1991, 0843), includes U.S. EPASolid Waste (SW) 846 quantitative and detection limits for the various required analytes.

7.13 SWMU Aggregate I, Phase I

SWMU No. 35-015(b), the location of a former waste oil treatment facility, is listed on the HSWA Module VIII (EPA 1990, 0306) (Table 1-1). Close to the former waste oil treatment facility, but not listed on the HSWA Module, is SWMU No. 35-014(d), which was the location of a dielectric oil spill. Also close to SWMU No. 35-015(b) are SWMU Nos. 35-003(j and k), which are the location of oil storage tanks. Because of the proximity of SWMU Nos. 35-014(d) and 35-003(j and k) to SWMU No. 35-015(b), all four SWMUs will be aggregated into the Phase I investigation for SWMU No. 35-015(b), the waste oil treatment facility. SWMU No. 35-015(b) and aggregates are located on the east end of TA 35 (Figure 7-28). This section of TA-35 is located on a finger mesa between Mortandad and Ten Site canyons. A Phase I investigation will characterize SWMU No. 35-015 and its aggregates according to the technical approach outlined in Chapter 5.0.

Archival information in Chapter 3.0 indicates that dielectric oil dominates the waste stream from this SWMU aggregate. While the amount of dielectric oil spilled has not been documented, archival photographs show discharges and soil stains. Significant releases that occurred between 1986 and 1988 have been documented.

7.13.1 Sampling Plan Rationale and Objectives

The objective of surface and subsurface characterization for this SWMU aggregate is to determine if contamination exists. The characterization process will generate the following sampling activities:

- Collecting soil/rock data to determine if contaminants exist.
- Collecting soils/rock data to support transport model calculations.

The conceptual model for this aggregate is as follows:

- No evidence exists that any D&D activity took place at Aggregate I other than capping the stained soils with asphalt.
- No evidence exists that any other constituent was spilled other than dielectric oil. Since the area was capped with asphalt, little dielectric oil is likely to have evaporated/transpired, and the contaminant's movement is likely to have been retarded. However, the proximity to other known contaminated sites requires a Phase I investigation of the area.
- The most likely transport mechanism for these areas is associated with hydrologic movement in the soil and vadose zone.
- If no D&D activity has occurred, the visual observation of soil stains will be the initial starting point for sample points. Archival information indicates the area detailed in the sampling plan is considered adequate for the Phase I investigation.
- Spills that have been washed down storm gutters are discussed in the SAP for SWMU No. 35-003(r) (the canyon disposal area for the wastewater treatment plant). SWMU No. 35-003(r) is the location of these gutters' outfalls.

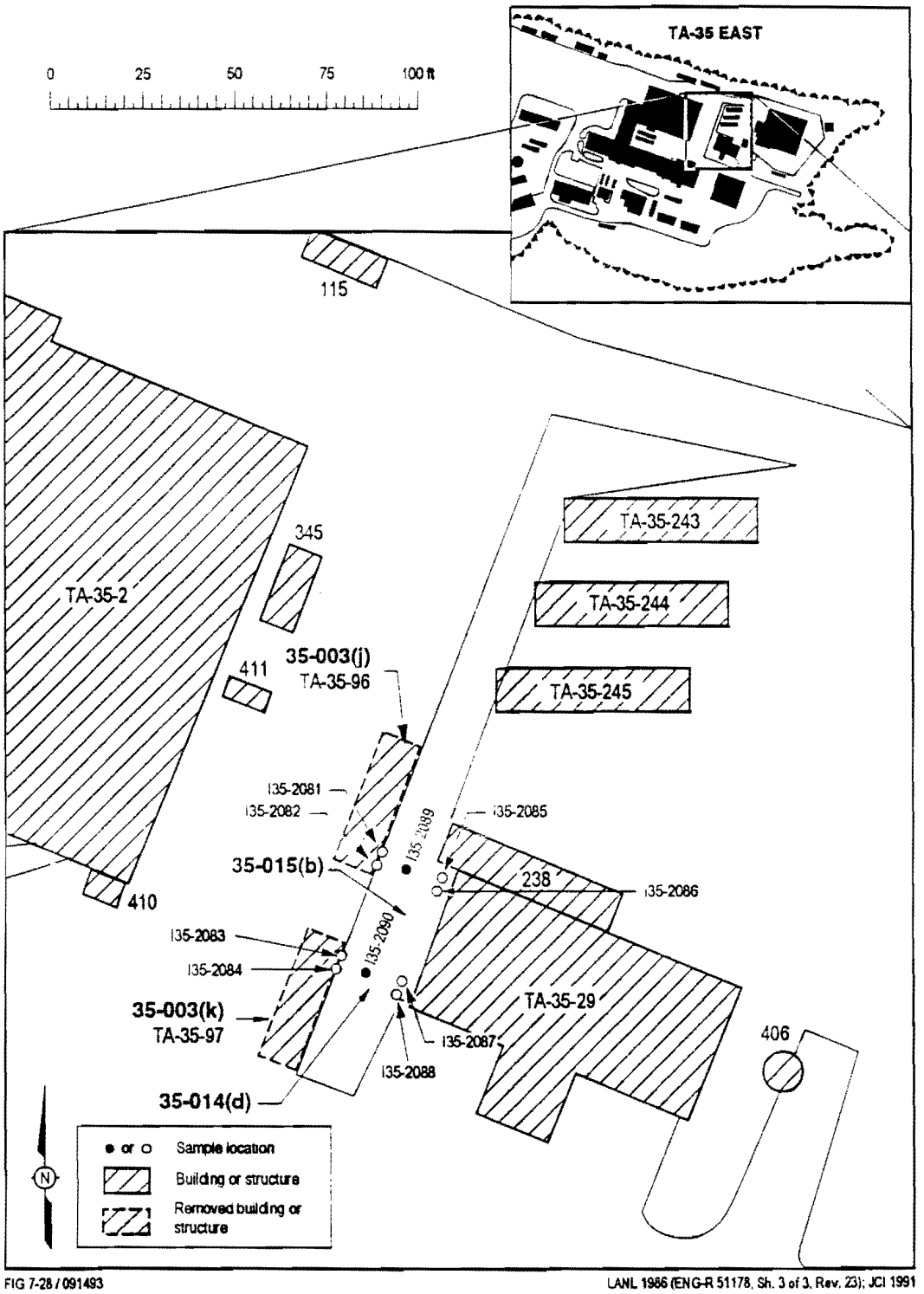


FIG 7-28 / 091493 LANL 1986 (ENG-R 51178, Sh. 3 of 3, Rev. 23); JCI 1991

Figure 7-28. Schematic sample location map for SWMUs 35-003(j and k), 35-014(d) and 35-015(b), Aggregate I.

A decision logic diagram for Phase I field investigation activities to be conducted at SWMU Aggregate I is presented in Figure 7-29 and discussed in the following text.

7.13.2 Phase I Field Investigation Activities

Field activities in this investigation include the engineering survey and environmental survey discussed in Section 7.4, surface sampling, and subsurface sampling.

Following the engineering survey, a radiation survey will be conducted over the area using a scintillation detector. Simultaneously with the radiation survey, the area will be **monitored** for the presence of VOCs **using a OVA, FID, or PID.**

Surface Investigation

The sampling plan will be developed in phases. The first phase will locate the areas that are likely to be contaminated, and the investigation will be expanded if contaminants are found. Two sections of asphalt surfacing, an area approximately 30 ft by 10 ft, will be removed at the northwest and southwest corners of building TA-35-29 (Figure 7-28). The asphalt will receive a radiological field screen using a scintillation meter. Surface samples will be gathered in the first 6 in. of soil at 8 random locations using a stainless-steel or Teflon scoop.

Subsurface Investigation

One borehole will be centered in **each of the two areas** in which the asphalt has been removed, and boring will extend to 6 ft in depth at 1-ft intervals. Boring will be conducted using a hollow-stem auger with a 5-ft split-barrel core sampler that will collect continuous core. Samples will be gathered from recovered sections indicating highest contamination (from field laboratory results). If no contamination is detected, random samples will be obtained from recovered sections.

7.13.3 Sample Screening and Analysis

Each sample collected will be screened with a scintillation detector for contact radiation. All sample packages will be screened for surface contamination and contact radiation. Samples will be analyzed at a for PCBs; SVOCs (in boreholes only); VOCs; gross-alpha, -beta, -gamma; gamma spectrometry; and alpha spectroscopy (Table 7-11).

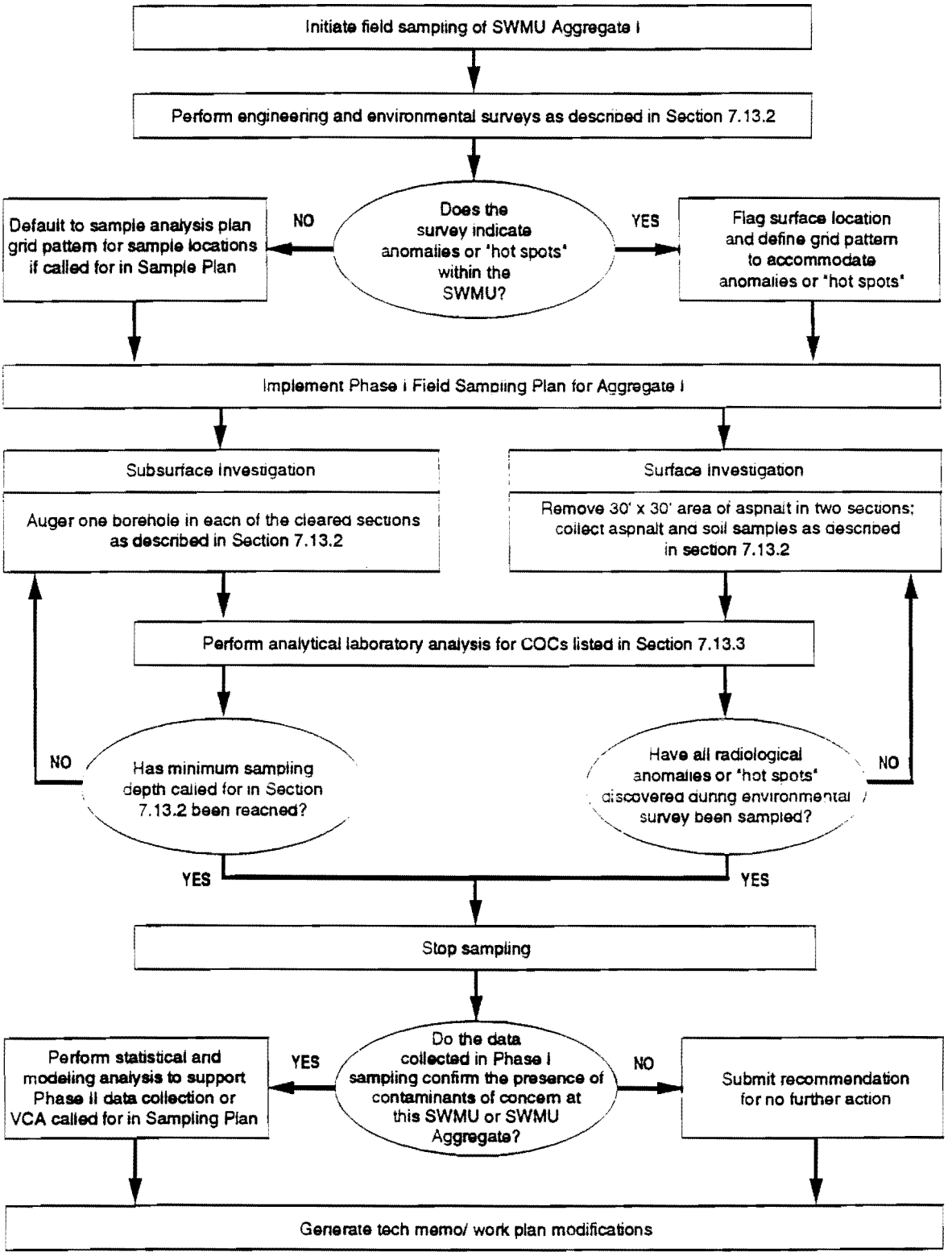


Figure 7-29. Decision logic for the sampling and analysis of SWMU Aggregate I.

TABLE 7-11

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE I

			Analyses Required*							
SWMU	SAMPLE NUMBER	DEPTH	Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
35-003	135-2081-S1	surface	1	1	1	0	1	0	1	0
(j)	135-2082-S1	surface	1	1	1	0	1	0	1	0
35-003	135-2083-S1	surface	1	1	1	0	1	0	1	0
(k)	135-2084-S1	surface	1	1	1	0	1	0	1	0
35-015	135-2085-S1	surface	1	1	1	0	1	0	1	0
(b)	135-2086-S1	surface	1	1	1	0	1	0	1	0
	135-2087-S1	surface	1	1	1	0	1	0	1	0
	135-2088-S1	surface	1	1	1	0	1	0	1	0
	135-2089-A1	0-1 ft	1	1	1	0	1	1	1	0
	135-2089-A2	1-2 ft	1	1	1	0	1	1	1	0
	135-2089-A3	2-3 ft	1	1	1	0	1	1	1	0
	135-2089-A4	3-4 ft	1	1	1	0	1	1	1	0
	135-2089-A5	4-5 ft	1	1	1	0	1	1	1	0
	135-2089-A6	5-6 ft	1	1	1	0	1	1	1	0
	135-2090-A1	0-1 ft	1	1	1	0	1	1	1	0
	135-2090-A2	1-2 ft	1	1	1	0	1	1	1	0
	135-2090-A3	2-3 ft	1	1	1	0	1	1	1	0
	135-2090-A4	3-4 ft	1	1	1	0	1	1	1	0
	135-2090-A5	4-5 ft	1	1	1	0	1	1	1	0
	135-2090-A6	5-6 ft	1	1	1	0	1	1	1	0
Rinsate Blanks			1	1	1	0	1	1	1	0
Bottle Blanks			0	0	0	0	1	1	1	0
Trip Blanks			0	0	0	0	1	0	0	0
Duplicates			1	1	1	0	1	1	1	0
TOTALS			22	22	22	0	24	15	23	0

*Section 5.0 ofthe Generic Quality Assurance (QA) Project Plan for RCRA Facility Investigations for the LANL ER Program (LANL 1991. 0843), includes U.S. EPASolid Waste (SW) 846 quantitative and detection limits for the various required analytes.

7.14 SWMU Aggregate J, Phase I

SWMU Aggregate J includes six sites that are associated with the former TA-42. All of these SWMUs are listed in the HSWA Module VIII (EPA 1990, 0306) (Table 1-1). SWMU No. 42-004 has been recommended for NFA and SWMU No. 42-002 has been renumbered to SWMU No. 42-002(a). The following SWMUs are included in **the "Revised Sampling and Analysis Plan for OU 1129 Aggregate J" (LANL 1992, 04-0295) in Appendix E of this Work Plan:**

- 42-001(a), an incinerator
- 42-001(b and c), two ash storage tanks
- 42-002(a), an indoor storage and decontamination area
- 42-002(b), an outdoor decontamination area
- 42-003, an inactive septic system

Aggregate J was revised because it is also the future site for construction of the Nuclear Safeguards Technology Laboratory (NSTL). The need for NSTL construction to start in FY93, plus the results from a reconnaissance sampling program (Fresquez 1991, 04-0075), has accelerated the investigation and the development of an interim action work plan pursuant to Section 3.12.2 of the Laboratory's Installation Work Plan and Section I of the Laboratory's RCRA Part B permit Hazardous and Solid Waste Amendments (HSWA) module. This interim action investigation, which was completed in September 1992, focused on the extent of the contamination found at the SWMUs during the reconnaissance survey conducted in January 1991 (Fresquez 1991, 04-0075). Following the collection of field samples and the evaluation of analytical results, a remediation plan will be recommended.

7.15 SWMU Aggregate K, Phase I

Aggregate K includes SWMU No. 48-001, an air exhaust system that is located on TA-48, north of Pajarito Road, on Mesita del Buey (the southern finger of South Mesa) between Mortandad Canyon on the north and Two Mile Canyon on the south (Figure 7-30). This SWMU is **not** listed in the HSWA Module VIII (EPA 1990, 0306) (Table 1-1). The air exhaust system (SWMU No. 48-001) is part of building TA-48-1, the Radiochemistry Laboratory. There are nine exhaust stacks at SWMU No. 48-001 (Figure 7-30): three stacks exhaust chemical fume hoods, three stacks carry exhaust from combustion boilers, one stack carries filtered exhaust from the alpha wing gloveboxes, one stack carries filtered exhaust from the hot cell addition, and one stack carries exhaust from a welding and degreasing booth in the basement.

The alpha wing, located in the northeast end of the building, is used for processing high-level alpha and/or beta-gamma emitters and its stack carries exhaust from the gloveboxes. This air exhaust system (Stack FE54) is of concern as it carries radioactive particles into the atmosphere. Mixed fission products, uranium, and plutonium are in the airborne releases. Stack FE54 is currently permitted and monitored under National Emission Standards for Hazardous Air Pollutants (NESHAP), but its operational history is well documented and predates NESHAP. Because contaminated air has been vented to the atmosphere without proper filtration during the history of this facility, the soil surrounding TA-48 has likely become contaminated.

Reports covering the years 1967 to 1970 indicate routine airborne releases of plutonium, uranium, and mixed fission products from stacks. Total discharge of airborne radioactivity was documented for 1967 through 1970 and 1971, and is presented in Tables 7-12 and 7-13.

Average daily releases of alpha emitters were estimated to be less than 0.1 pCi/m^3; releases for beta emitters ranged from 0.4 to 20 pCi/m^3 (LASL circa 1969, 0702). In 1984, measured airborne releases totaled 1,566 µCi of mixed fission products, 1.3 µCi of uranium, and 2.6 µCi of plutonium (Becker et al. 1985, 0029). The high-efficiency particulate air (HEPA) filter area for the exhaust system was monitored for radioactivity levels during a 1988 ER Program reconnaissance survey and was found to be 233 cpm (60 µR/hr) above background (Shafer circa 1989, 04-0187). Potential contamination at this area has existed from 1957 to the present.

In January 1991, five surface and five subsurface soil samples were collected from the site of a proposed parking lot immediately east of the security fence on the east side of TA-48 (Figure 7-30). The samples were "systematically collected over the entire area;" however, the exact locations from which samples were taken were not provided (Fresquez 1990, 04-0073; Fresquez 1991, 04-0077). The proposed parking lot area was suspected of being contaminated by fallout from improperly filtered air emissions. Levels of gross-beta and -gamma activity in all surface and subsurface samples were at background. However, gross-alpha activity ranged from background to 45 pCi/g for surface soil samples and from background to 65 pCi/g for subsurface samples. Alpha activity was below the Department of Energy (DOE) guideline value of 75 pCi/g for subsurface samples, but surface soil samples from the western and northwestern half of the proposed parking area exceeded the DOE guideline of >25 pCi/g for surface alpha activity (Fresquez 1991, 04-0077).

In April 1991, five surface and five subsurface soil samples were collected north of TA-48 as part of an Environmental Restoration Interim Action (ERIA) reconnais-

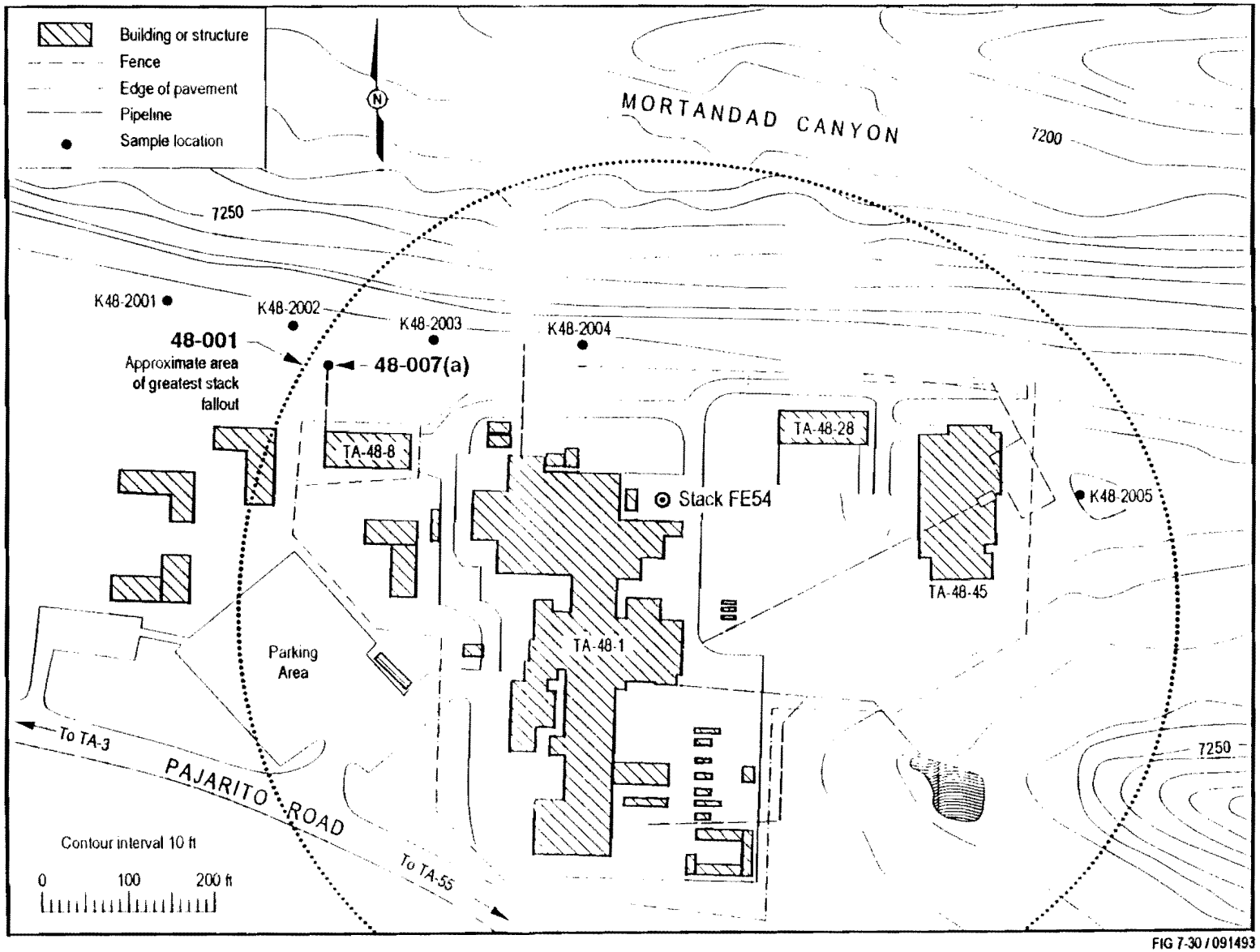


FIG 7-30 / 091493

Figure 30. Schematic sample location map for SWMU 48-001, Aggregate K.

TABLE 7-12

TOTAL DISCHARGE OF AIRBORNE RADIOACTIVITY AT TA-48 FOR 1967 THROUGH 1970

Source of Pollutant	Pollutant	1967 (Ci)	1968 (Ci)	1969 (Ci)	1970 (Ci)
Stacks	^{235}U	1.7×10^{-4}	1.3×10^{-4}	6.5×10^{-4}	2.4×10^{-5}
Stacks[a]	FP[b]	1.7×10^{-2}	1.29×10^{-2}	3.9×10^{-3}	1.4×10^{-3}
Stacks[c]	^{239}Pu	1.10×10^{-4}	1.46×10^{-4}	1.26×10^{-4}	3.1×10^{-5}
FE-45, 46[d]	^{239}Pu	—	—	—	2.6×10^{-5}
FE-45, 46[d]	FP[b]	—	—	—	1.6×10^{-3}
FE-51[d]	^{239}Pu	—	—	—	7.2×10^{-9}
FE-51[d]	FP[b]	—	—	—	6.9×10^{-8}

Source: Voelz (1971, 04-0194).
[a] Total discharge from stacks 1, 2, and 3.
[b] Fission products.
[c] Total discharge from stack 2.
[d] New operations in 1970.

TABLE 7-13

AIR EMISSIONS OF RADIONUCLIDES AT TA-48 FOR 1971

Source of Pollutant (Stacks)	Pollutant	Concentration in Air (μCi/ml)	Total Quantity Released During Reporting Period (μCi)
FE-11, 12, 13	^{235}U	8.2×10^{-14}	6
FE-11, 12, 13	FP[a]	2.7×10^{-13}	219
FE-15, 16	^{239}Pu	1.6×10^{-4}	11
FE-15, 16	FP[a]	6.0×10^{-13}	509
FE-37, 38, 29, 40	^{235}U	4.9×10^{-15}	0.4
FE-37, 38, 39, 40	FP[a]	4.1×10^{-14}	4
FE-45	^{239}Pu	1.0×10^{-14}	8
FE-45	FP[a]	1.7×10^{-12}	1,018
FE-51	^{239}Pu	2.6×10^{-15}	0.1
FE-51	FP[a]	2.4×10^{-14}	1

Source: LASL (1972, 04-0146).
[a] Fission products.

sance survey at the site of a proposed building, the Weapons Isotope Separator Facility (Fresquez 1991, 04-0079). Surface samples were defined as samples taken between 0 and 4.8 ft in depth, and subsurface samples were defined as samples collected from greater than 4.8 ft in depth (Fresquez 1991, 04-0078). The samples were taken in the vicinity of SWMU Nos. 48-001, 48-005, and 48-007(e) (Figure 7-30). Levels of gross-alpha and -gamma activity were at background for all samples collected. No PCBs or SVOCs were detected in any of the samples. All samples revealed concentrations of TCLP metals (Ag, As, Ba, Cd, Cr, Hg, Pb, and Se) to be less than EPA guideline levels. Trace amounts of three VOCs (p-Cymene, cumene, and Freon) were detected at <52 ppb. EPA action- level concentrations are not listed for these VOCs (Fresquez 1991, 04-0079).

7.15.1 Sampling Plan Rationale and Objectives

The basic objective of the surface and subsurface characterization for this SWMU is to determine if contaminants are present, and if found, initiate investigations as to whether or not the contaminants have migrated. The characterization process will meet the following sampling objectives:

- Collecting geologic data (e.g., attitude and frequency of linear features such as fractures, attitude of tuff units, textures of volcanic rocks) to support transport model calculations.
- Classifying contaminant pathways on the surface and subsurface.
- Detecting and classifying contaminants.
- Originating investigations to determine if contaminants have migrated laterally and vertically.

The conceptual model for SWMU No. 48-001 is thought to involve a three-stage process:

1) Airborne material expelled from the exhaust systems is deposited (settled) onto the soils. The mechanisms governing the deposition of contaminants are wind direction, stack height and velocity, and particle size.

2) Contaminants deposited on soils are washed into Mortandad Canyon. The mechanisms governing sediment transport are run-off and particle size. Run-off is controlled by the amount of precipitation, the grade of the surface, and the rate of infiltration.

3) Contaminants deposited on soils are transported by water and infiltrate into the soil horizon (unsaturated zone) as colloids. The depth colloidal particles migrate is controlled by flux and sorption.

In the preliminary SAP development of Aggregate K, the AIRDOS-EPA model was used to predict the location of contaminant particle deposition. Emissions of ^{90}Sr, ^{144}Ce, ^{137}Cs, ^{241}Am, ^{239}Pu, and ^{238}Pu were modeled (Figures 7-31 and 7-32). Other contaminants are not presented because AIRDOS predicted the deposition pattern to be similar for all contaminants modeled. Further discussion of AIRDOS modeling results is located in Section 7.2.

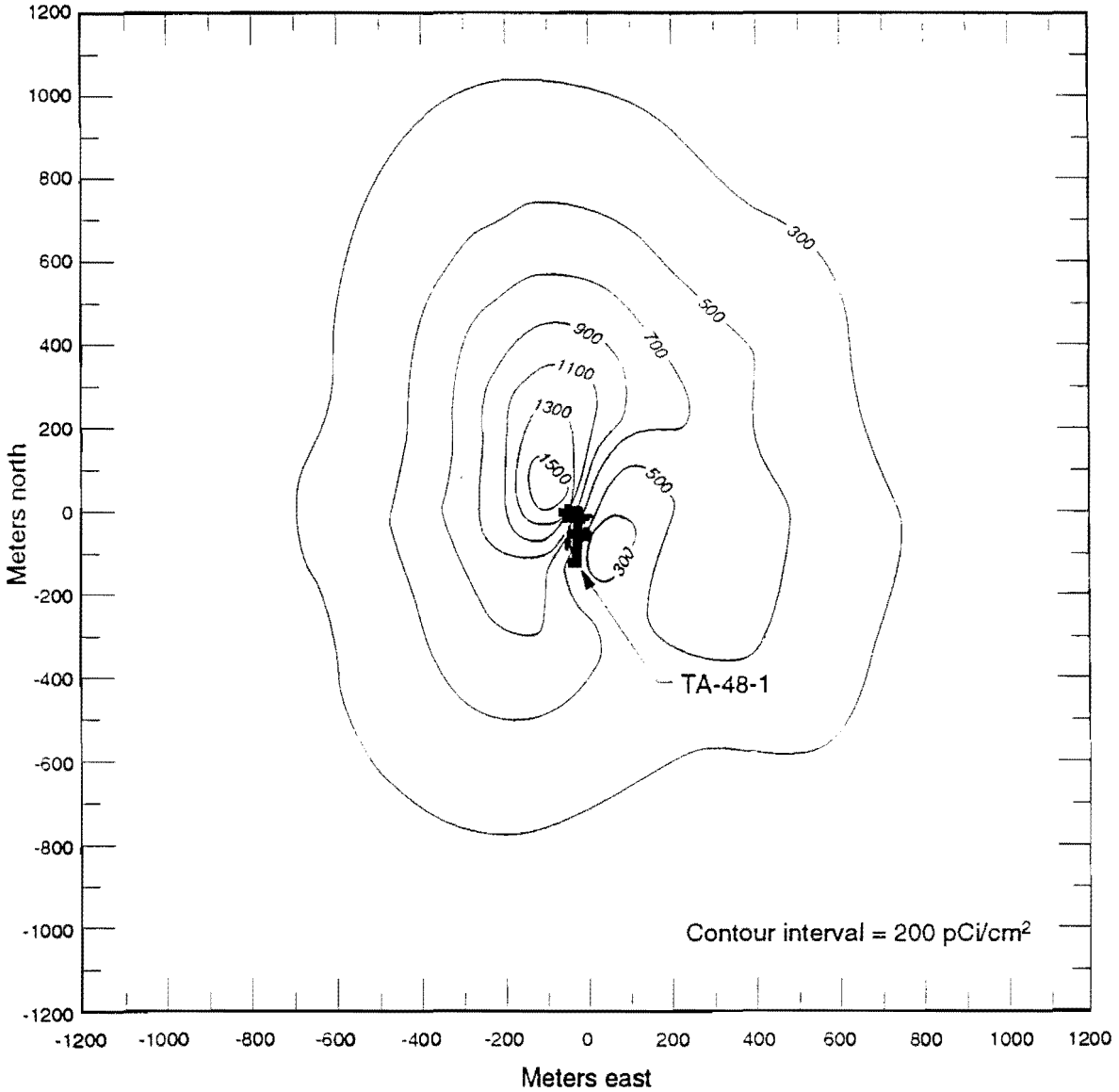


Figure 7-31. Isopleth map showing the distribution of Cs-137 at SWMU 48-001, TA-48 stack FE54.

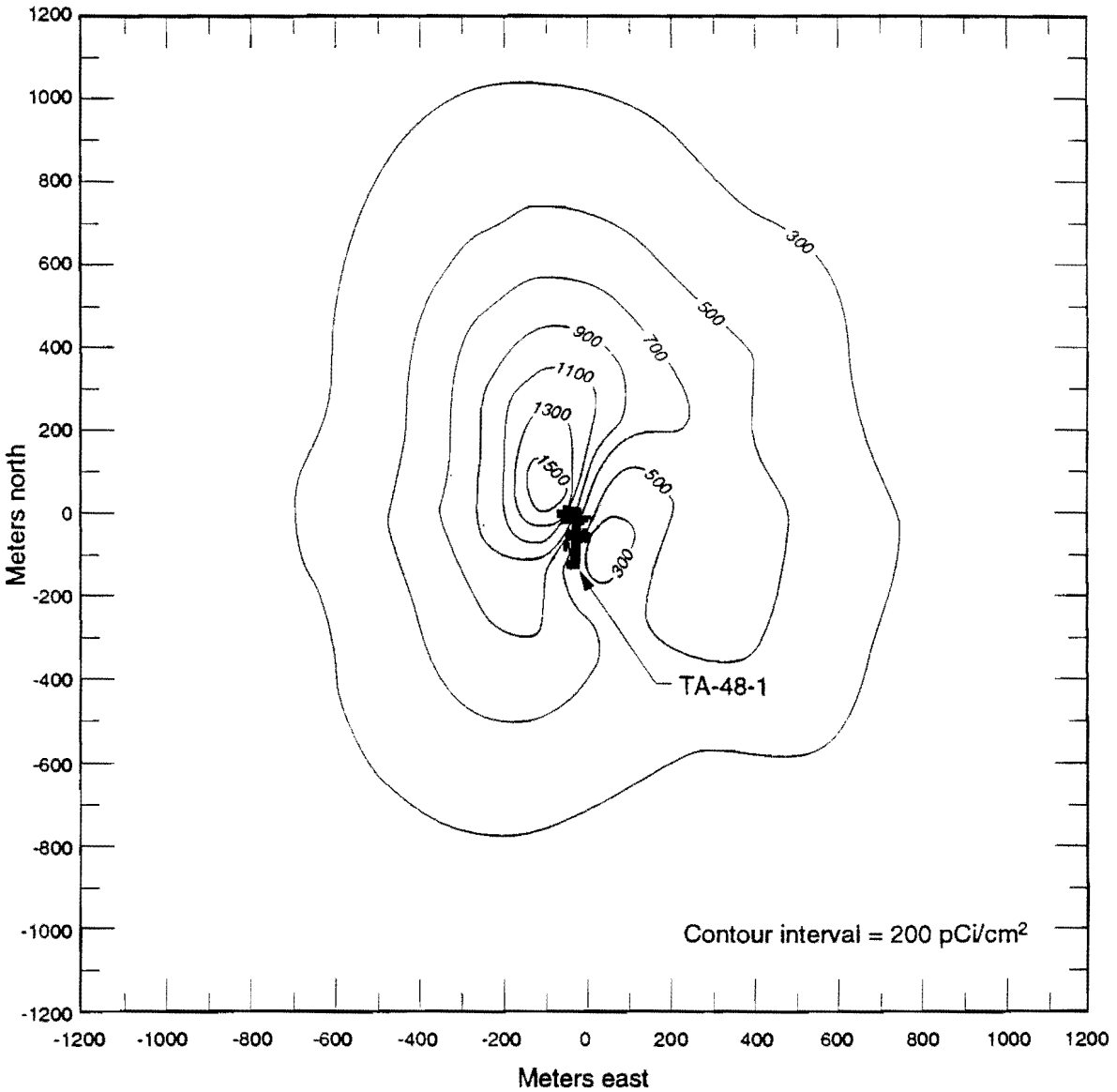


Figure 7-31. Isopleth map showing the distribution of Cs-137 at SWMU 48-001, TA-48 stack FE54.

A decision logic diagram for Phase I field investigation activities to be conducted at SWMU Aggregate K is presented in Figure 7-33 and discussed in the following text.

7.15.2 Phase I Field Investigation Activities

The sampling plan is designed to locate potential contaminants at their most likely source. The field activities will include the engineering survey and environmental survey discussed in Section 7.4, and surface and subsurface sampling (Figure 7-30).

During the environmental survey, observations will be made to note any drainage gullies to the canyons; if any exist, they will be mapped as potential transport pathways for sediment. Observations will also be made on the canyon edges to identify fracture patterns in the tuff underlying the soils; if any prevailing fracture geometry is observed, these will be mapped.

Four locations will be sampled in the area in which the AIRDOS model predicted higher concentrations of radionuclides, and one location in which the model predicted low concentrations (Figure 7-32). This will help to confirm modeling results (validate the model).

The sampling objective is to sample within the higher concentration isopleths as predicted by AIRDOS. Figure 7-30 shows the approximate sampling locations. Samples will be taken by hand auger; however, the surface sample may be taken with a Teflon or stainless-steel scoop. Logs describing soil horizon changes will be prepared. Three samples will be taken at each location on the surface, top 1 ft, and subsurface. Subsurface sampling will continue as deep as the hand auger allows. Soils are expected to have a depth of 2 to 3 ft. The samples will be surveyed (scanned) on site for radiation, vertical samples will be taken until radiation is not detected or is at background levels.

7.15.3 Sample Screening and Analysis

Each sample will be screened with a scintillation detector for contact radiation. All sample packages will be screened for surface contamination and contact radiation.

Soil samples with detectable levels of organic vapors, screened using a PID or OVA, will be analyzed for VOCs. Archival information provides little information on the identity of site contaminants; therefore, the first 50% of all surface locations will be analyzed for the full radiological and metal analytical suite (Table 7-14).

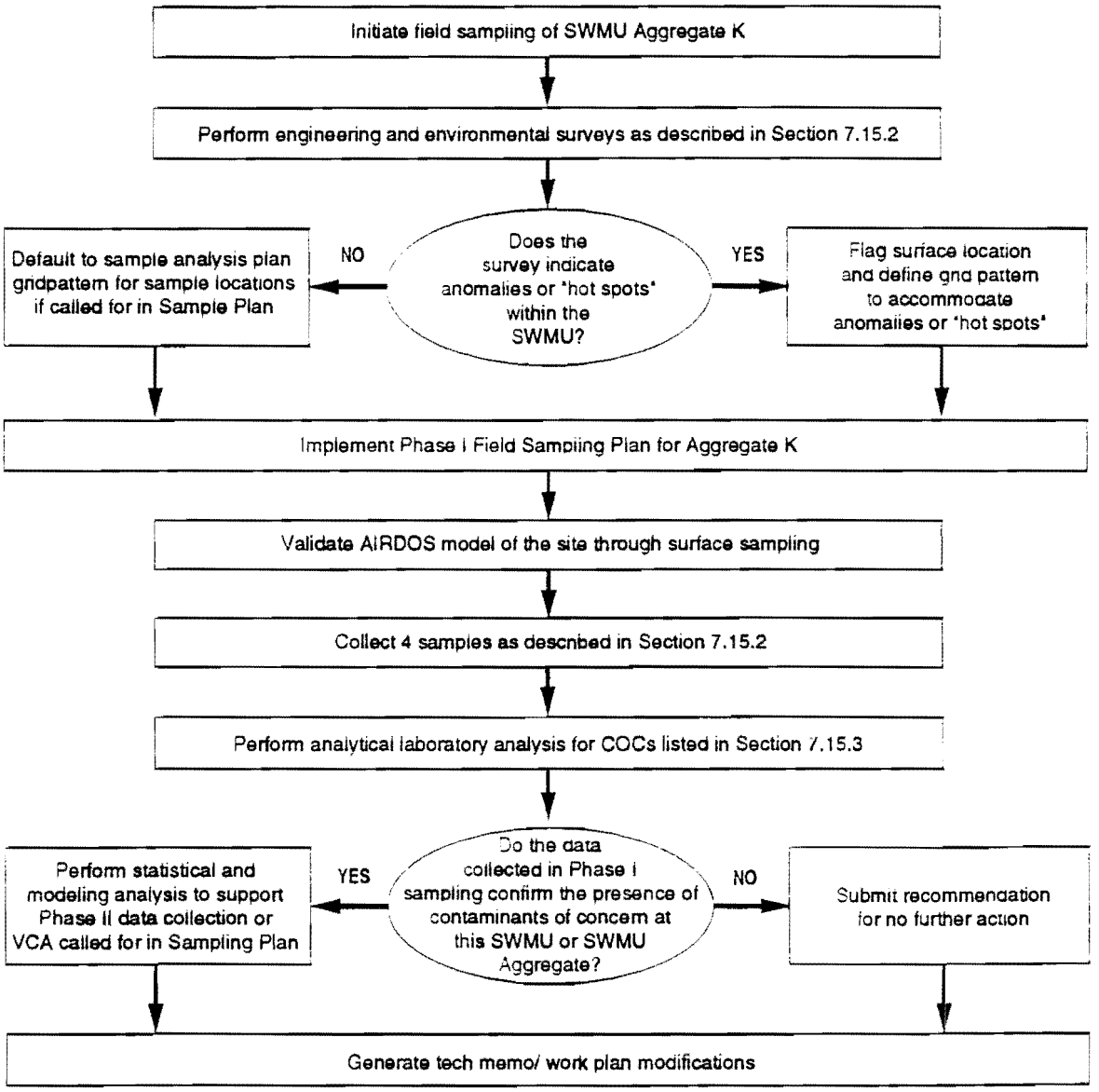


Figure 7-33. Decision logic for the sampling and analysis of SWMU Aggregate K.

TABLE 7-14
PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE K

			Analyses Required *							
SWMU	SAMPLE NUMBER	DEPTH	Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
48-001	K48-2001-A1	0-1 ft	1	1	1	1	**	1	0	0
	K48-2001-A2	1-2 ft	1	1	1	1	**	1	0	0
	K48-2001-A3	2-3 ft	1	1	1	1	**	1	0	0
	K48-2002-A1	0-1 ft	1	1	1	1	**	1	0	0
	K48-2002-A2	1-2 ft	1	1	1	1	**	1	0	0
	K48-2002-A3	2-3 ft	1	1	1	1	**	1	0	0
	K48-2003-A1	0-1 ft	1	1	1	1	**	1	0	0
	K48-2003-A2	1-2 ft	1	1	1	1	**	1	0	0
	K48-2003-A3	2-3 ft	1	1	1	1	**	1	0	0
	K48-2004-A1	0-1 ft	1	1	1	1	**	1	0	0
	K48-2004-A2	1-2 ft	1	1	1	1	**	1	0	0
	K48-2004-A3	2-3 ft	1	1	1	1	**	1	0	0
	K48-2005-A1	0-1 ft	1	1	1	1	**	1	0	0
	K48-2005-A2	1-2 ft	1	1	1	1	**	1	0	0
	K48-2005-A3	2-3 ft	1	1	1	1	**	1	0	0
Rinsate Blanks			1	1	1	1	**	1	0	0
Bottle Blanks			1	1	1	1	**	1	0	0
Trip Blanks			0	0	0	0	**	0	0	0
Duplicates			1	1	1	1	**	1	0	0
TOTALS			18	18	18	18	0	18	0	0

*Section 5.0 ofthe Generic Quality Assurance (QA) Project Plan for RCRA Facility Investigations for the LANL ER Program (LANL 1991, 0843), Includes U.S. EPASolid Waste (SW) 846 quantitative and detection limits for the various required analytes.

** A discrete sample will be collected and analyzed for VOCs only if VOCs are first detected using the appropriate OVA, FID, or PID field instrument.

7.16 SWMU Aggregate L, Phase I

SWMU Nos. 48-002(a and b) include a former container storage area and are Phase I characterization areas according to the process outlined in Chapter 5.0. Both of these SWMUs are listed in the HSWA Module VIII (EPA 1990, 0306) (Table 1-1). SWMU Nos. 48-002(a and b) are located on TA-48, north of Pajarito Road, on Mesita del Buey (the southern finger of South Mesa) between Mortandad Canyon on the north and Two Mile Canyon on the south (Figure 7-34). The open circles in Figure 7-34 show the location of SWMU Nos. 48-002(a and b).

The storage area (SWMU No. 48-002) was located on the south end of building TA-48-1, the Radiochemistry Laboratory (Figure 7-34). SWMU No. 48-002(a) was a storage area outside of the building. SWMU No. 48-002(b) was a container storage area located at one of the loading dock areas.

An initial field observation report (Perkins 1986, 04-0169) mentioned the presence of about 200 rusty flasks in decayed and broken wooden-frame holders at SWMU No. 48-002(a). A follow-up memorandum (Garvey 1986, 04-0087) confirmed the presence of these flasks. Each flask was estimated to hold about 2 quarts of high-purity mercury, which was thought to have been recycled at TA-50-1 by a triple distillation process to remove radionuclides. The flasks were estimated to have been there for several years starting between 1976 to 1981 and ending approximately 1989, when the mercury was eventually removed (LANL 1990, 0145). The available documentation contains no indication of any spills or leaks associated with this storage area; however, because the documentation is sparse and unclear, this SWMU was not included on the NFA list. As no reported spills or leaks associated with the mercury storage area exist, the area might not have been contaminated with mercury; regardless, sampling will be conducted as described in this SAP.

SWMU No. 48-002(b) was a container area located at one of the loading dock areas on the south side of building TA-48-1. The 1986 Comprehensive Environmental Response Program (CEARP) field survey noted the presence of labeled and unlabeled drums at the site, and evidence of spills and leaks (Perkins 1986, 04-0169). A November 1988 field survey noted spills at this area, which were apparently from leaky drums. The 1989 Laboratory subcontractor environmental audit noted only one long, unlabeled cylinder (LANL 1990, 0145). All materials were removed from this area before July 1991, and the site is no longer used for storage.

In January 1991, five surface and five subsurface soil samples were collected from the site of a proposed parking lot immediately east of the security fence on the east side of TA-48 (Fresquez 1990, 04-0073; Fresquez 1991, 04-0077). The proposed parking lot area was suspected of being contaminated by run-off from the container storage areas on the south side of the building. Levels of gross-beta and -gamma activity in all surface and subsurface samples were at background. However, gross-alpha activity ranged from background to 45 pCi/g for surface soil samples and from background to 65 pCi/g for subsurface samples. Alpha activity was below the DOE guideline value of 75 pCi/g for subsurface samples, but surface soil samples from the western and northwestern half of the proposed parking area exceeded the DOE guideline of 25 pCi/g for surface alpha activity (Fresquez 1991, 04-0077). No VOCs were detected in any of the samples, and most samples did not contain detectable levels of SVOCs. Di-n-butyl-phthalate (an SVOC plasticizer) was detected in two samples at 1 ppm (below the EPA action level). The only PCBs detected, mixed arochlors at <0.61 ppm, were also below EPA action levels.

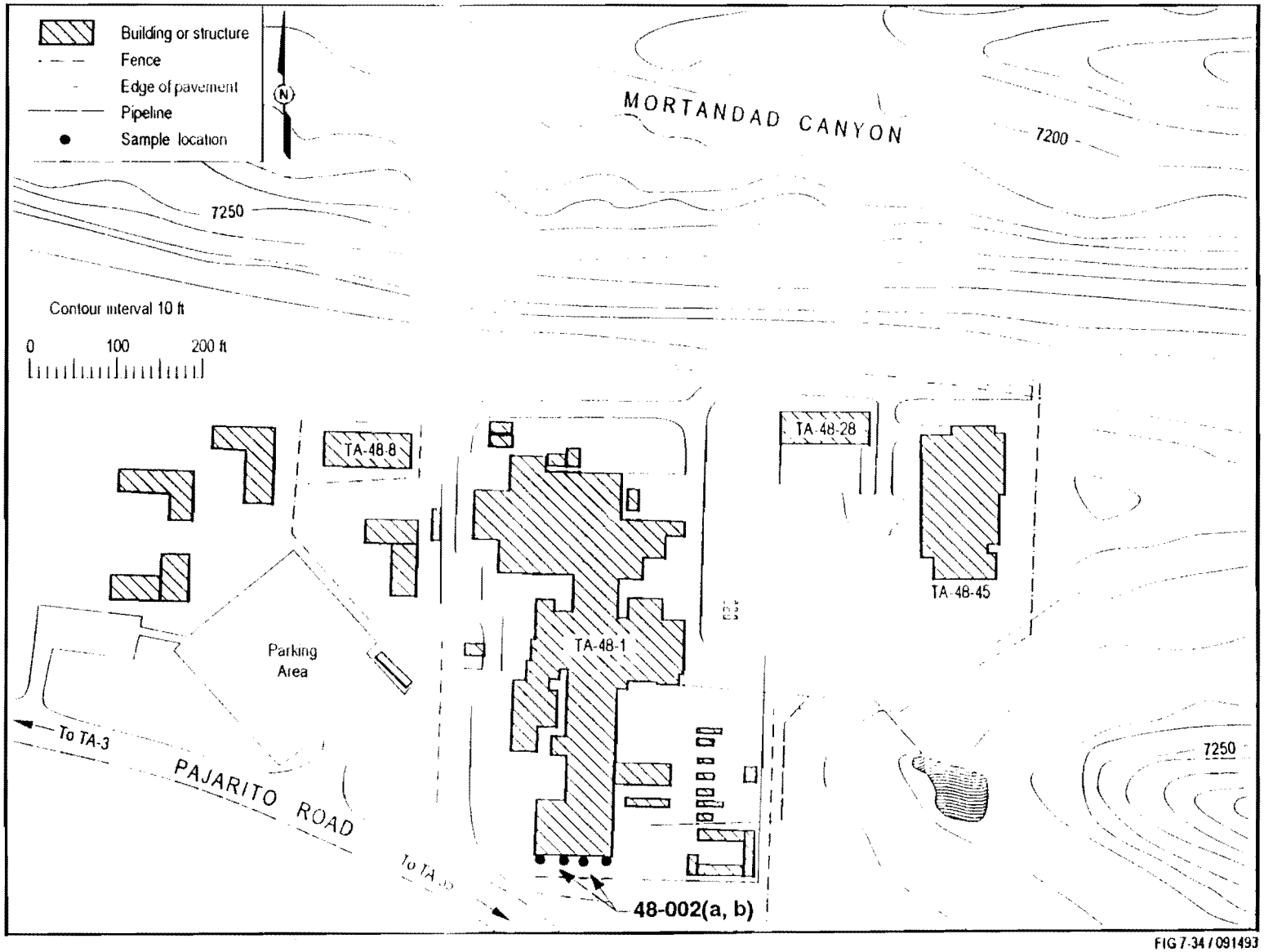


FIG 7-34 / 091493

Figure 7-34. Schematic sample location map for SWMUs 48-002 (a and b), Aggregate L.

7.16.1 Sampling Plan Rationale and Objectives

The objective of the surface and subsurface characterization for this SWMU is to determine the presence of contaminants, and if found, initiate investigations to determine whether the contaminants have migrated. The characterization process will meet the following sampling objectives:

- Collecting geologic data (see Section 7.11) to support transport model calculations.
- Classifying contaminant pathways on the surface and subsurface.
- Detecting and classifying contaminants.
- Originating investigations to determine if contaminants migrated laterally and vertically.

The conceptual model for SWMU No. 48-002 takes into account two means of contaminant occurrence and transport:

1) Mercury or other stored contaminants may have been spilled in the storage area, and/or storage tanks on paved surfaces may have leaked. The contaminants may have been transported from the paved surfaces to exposed soils by surface run-off.

2) Contaminants deposited on soils may have been transported by water and infiltrated into the soil horizon (unsaturated zone) as colloids.

A decision logic diagram for Phase I field investigation activities to be conducted at SWMU Aggregate L is presented in Figure 7-35 and is discussed in the following text.

7.16.2 Phase I Field Investigation Activities

The sampling plan is designed to locate potential contaminants. The field activities for this aggregate include the engineering and environmental surveys discussed in Section 7.4, and surface sampling (Figure 7-34). During the engineering and environmental surveys, any stained areas will be identified.

Four locations will be sampled in the storage area or in areas in which staining is detected. Figure 7-34 shows the approximate sampling locations.

Soils are expected to have a depth of 2 to 3 ft. At each sampling location, samples will be collected at the surface, in the 1-ft interval beneath the surface, and in the interval between 1 and 3 ft below the surface. Surface samples will be taken with a Teflon or stainless-steel scoop. Subsurface samples will be taken using a hand auger. Observations pertaining to soil horizon changes will be recorded. The samples will be surveyed (scanned) on site for radiation and for organic vapors using a PID or OVA.

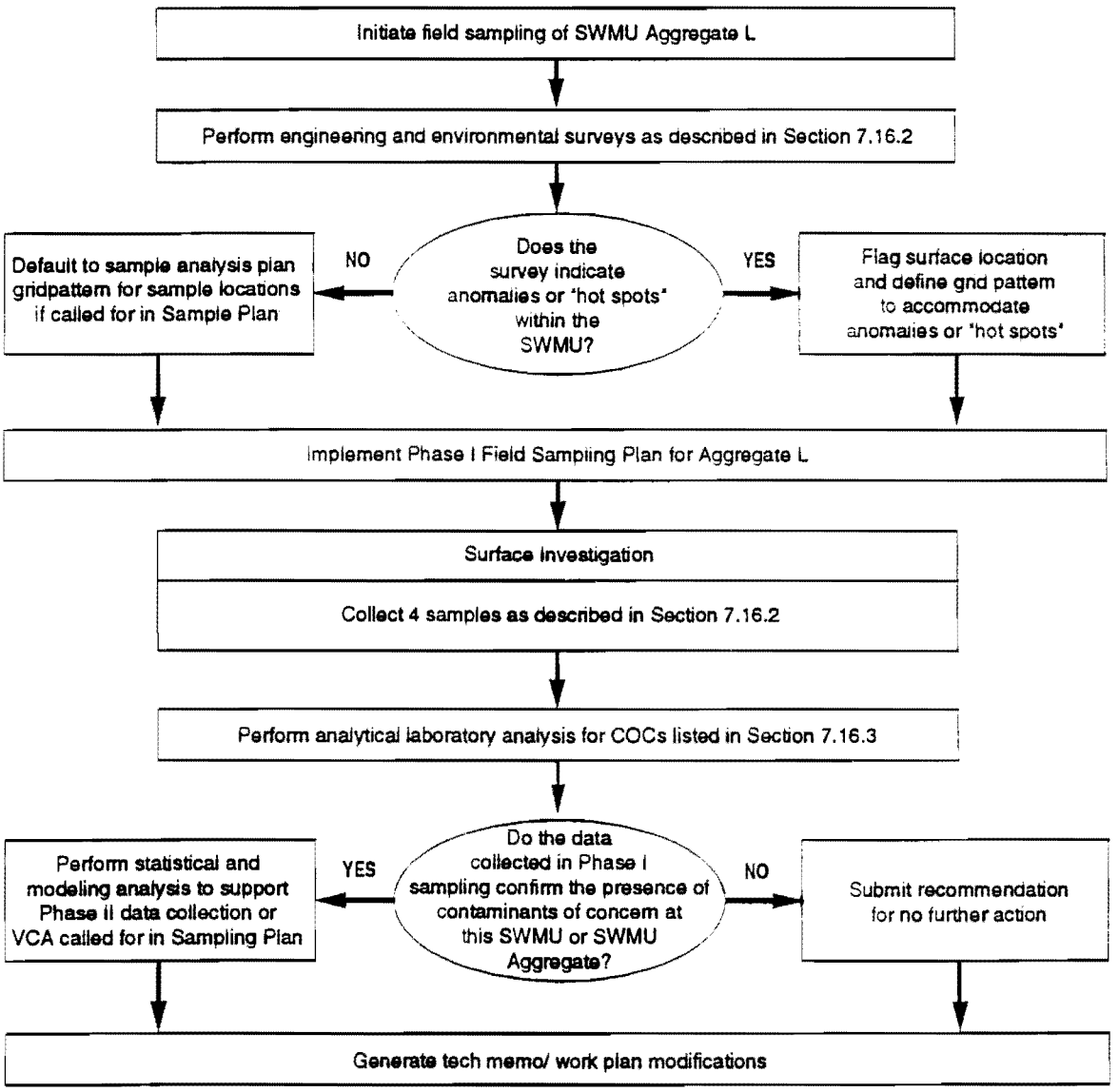


Figure 7-35. Decision logic for the sampling and analysis of SWMU Aggregate L.

7.16.3 Sample Screening and Analysis

Each sample will be screened with a scintillation detector for contact radiation. All sample packages will be screened for surface contamination and contact radiation. If positive radiological results are obtained from field screening, the samples will be analyzed in the laboratory for gross-alpha, -beta, -gamma; gamma spectrometry; and alpha spectroscopy. Samples with detectable levels of organics indicated by the PID or OVA will be analyzed for VOCs and SVOCs. Samples that can be identified as possible container leaks or spills will be analyzed for metals, and samples collected from the mercury storage area will be analyzed for mercury. Table 7-15 summarizes sampling requirements for SWMU Aggregate L.

TABLE 7-15

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE L

			Analyses Required*								
SWMU	SAMPLE NUMBER	DEPTH	Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil	Mercury
42-002 (a and b)	L48-2006-A1	surface	1	1	1	1	**	1	0	0	1
	L48-2006-A2	0-1 ft	1	1	1	1	**	1	0	0	1
	L48-2006-A3	1-3 ft	1	1	1	1	**	1	0	0	1
	L48-2007-A1	surface	1	1	1	1	**	1	0	0	1
	L48-2007-A2	0-1 ft	1	1	1	1	**	1	0	0	1
	L48-2007-A3	1-3 ft	1	1	1	1	**	1	0	0	1
	L48-2008-A1	surface	1	1	1	1	**	1	0	0	1
	L48-2008-A2	0-1 ft	1	1	1	1	**	1	0	0	1
	L48-2008-A3	1-3 ft	1	1	1	1	**	1	0	0	1
	L48-2009-A1	surface	1	1	1	1	**	1	0	0	1
	L48-2009-A2	0-1 ft	1	1	1	1	**	1	0	0	1
	L48-2009-A3	1-3 ft	1	1	1	1	**	1	0	0	1
Rinsate Blanks			1	1	1	1	**	1	0	0	1
Bottle Blanks			1	1	1	1	**	1	0	0	1
Trip Blanks			0	0	0	0	**	0	0	0	0
Duplicates			1	1	1	1	**	1	0	0	1
TOTALS			15	15	15	15	0	15	0	0	15

*Section 5.0 ofthe Generic Quality Assurance (QA) Project Plan for RCRA Facility Investigations for the LANL ER Program (LANL 1991, 0843), includes U.S. EPASolid Waste (SW) 846 quantitative and detection limits for the various required analytes.

** A discrete sample will be collected and analyzed for VOCs only if VOCs are first detected using the appropriate OVA, FID, or PID field instrument.

7.17 SWMU Aggregate M, Phase I

SWMU Aggregate M contains SWMU No. 48-003, an inactive septic system located north of Pajarito Road. SWMU No. 48-003 is listed in the HSWA Module VIII (EPA 1990, 0306) (Table 1-1). SWMU No. 48-003 was formerly SWMU No. 48-003(a and b) in the HSWA Module. The SWMU contains two components, a leach field and outfall. Figure 7-36 depicts the location of SWMU No. 48-003. A detailed description of the location, site activities, and history of SWMU No. 48-003 within OU 1129 is found in Section 3.5 of this Work Plan.

7.17.1 Sampling Plan Rationale and Objectives

The objective of this Phase I sampling plan is to determine the presence or absence of surface and subsurface contamination at the locations of the SWMU. This sampling plan uses a judgmental sampling approach to investigate the septic tank, filter bed, and outfall that compose SWMU No. 48-003. If contamination is confirmed to be present after the Phase I investigation, a Phase II investigation will be conducted to determine the nature and extent of contamination at the site. Sampling activities are biased toward areas in which residual contamination is most likely to be present on the basis of the following conceptual model for a release at this site:

- The waste stream is not defined because archival information indicates that along with sanitary waste, an unknown variety and amount of other wastes were deposited into the septic system.
- Any remaining contaminant plumes may have moved vertically along fracture planes that are in contact with the leach fields and outfalls because of the transport mechanism provided by liquids associated with the waste stream.

The surface investigations at Aggregate M are designed primarily to answer the following questions:

1) Does surface and subsurface contamination currently exist in Aggregate M?
2) Are there any near-surface artifacts remaining that represent potential contaminant release points?
3) What is the potential for surface and subsurface migration of contaminants?
4) What are the **past** waste stream constituents?

If contamination is confirmed to be present after the Phase I investigation, a Phase II investigation will be conducted to determine the nature and extent of contamination at the site.

Archival information indicates that the contaminants that may be present at SWMU No. 48-003 may include organics, inorganics, and radionuclides (Section 3.5). The septic system at SWMU No. 48-003 primarily received sanitary waste; however, an unknown amount of hazardous chemicals and radionuclides was suspected to have been discharged to the tank. The septic tank and filter bed were removed during a 1986 D&D effort. The former site of the septic tank and a corner of the former filter

bed are currently located beneath building TA-48-45 (Figure 7-36). The majority of the leach field area lies outside the building. Investigation of the leach field outside the building is considered to be indicative of potential contaminants located beneath the building. The soil beneath building TA-48-45 will not be investigated. Therefore, the Phase I investigation will be limited to the former filter bed outside the east perimeter of the building and the outfall discharge area located to the north.

A decision logic diagram for Phase I field investigation activities to be conducted at SWMU Aggregate M is presented in Figure 7-37 and discussed in the following text.

7.17.2 Phase I Field Investigation Activities

The technical approach for the Phase I assessment of SWMU No. 48-003 will consist of four tasks. These tasks include the engineering survey and environmental surveys discussed in Section 7.4, subsurface sampling of the leach field area, and surface sampling of the outfall area (Figure 7-36).

During the land engineering survey, the former filter bed area and outfall will be located, and a 60-ft-wide by 90-ft-long area encompassing the entire filter bed will be located and staked into grid with blocks 30 ft by 30 ft (Figure 7-36). The radiation survey will be conducted along the lines of the grid to identify potential radiological anomalies. Stationary radiological counts for a duration of one minute will be collected in the center of each grid block using a FIDLER and the area will be surveyed for the presence of VOCs using an OVA.

SWMU No. 48-003, Filter Bed – Subsurface Investigation

The septic tank and associated filter bed were decontaminated and decommissioned in 1986. According to engineering drawings, the former filter bed was a surface feature measuring 40 ft and 7 in. wide by 81 ft and 2 in. long. A 60-ft by 90-ft grid will be established during the engineering survey to cover the area of the leach field. During a 1988 site reconnaissance, gamma activity was measured at 14 mR/hr approximately 3 ft from the surface near the site of the former filter bed. These survey results suggest that D&D may not have been adequate and that remnant radioactive contamination may be present.

First, six soil boring locations will be selected at anomalous areas identified within the grid during the environmental survey. If no anomalies are present, soil boring locations will be selected at random within each of the six grid blocks. One borehole will be drilled within the six (30-ft by 30-ft) grid blocks to identify potential contamination at the leach field.

Once the area is surveyed and anomalies are identified, six soil borings will be installed to depth of 15 ft using a decontaminated continuous 5-ft core barrel. As the 5-ft sections of core are retrieved from the borehole using a wireline, the soil and/or rock will be screened with a scintillation detector and PID. Screening measurements will be recorded on the field log. Soil will be sampled from intervals with the greatest above-background contamination. If no above-background contamination is detected, the upper 0 to 5 ft of the first core interval and the midpoint of the bottom two core intervals (5 to 10 ft and 10 to 15 ft) will be sampled. Soil samples will be collected with a stainless-steel trowel. The purpose of the soil borings is to provide a contamination profile, if present, and to help gain geographic control as to the exact

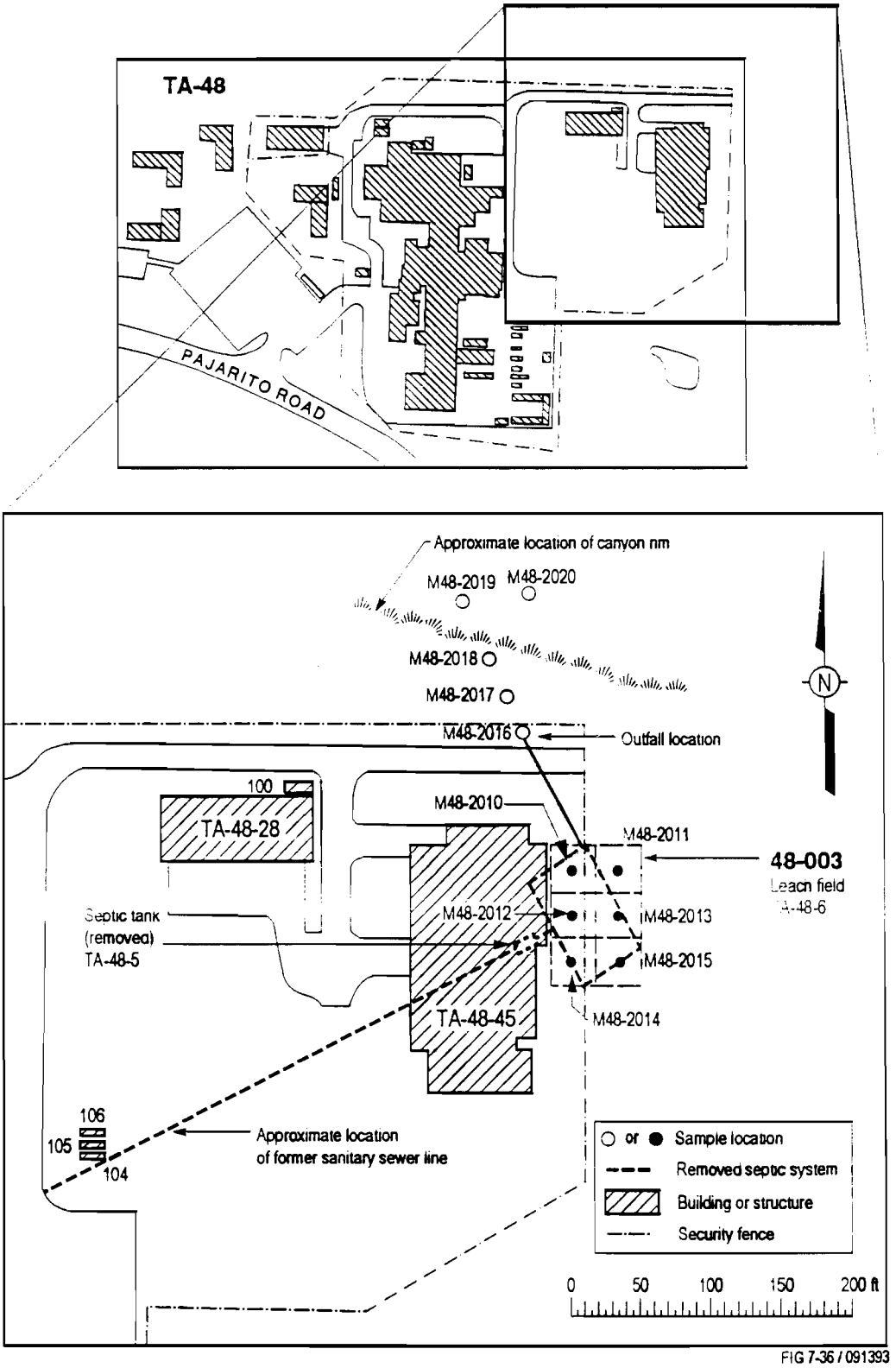


Figure 7-36. Schematic sample location map for SWMU 48-003, Aggregate M.

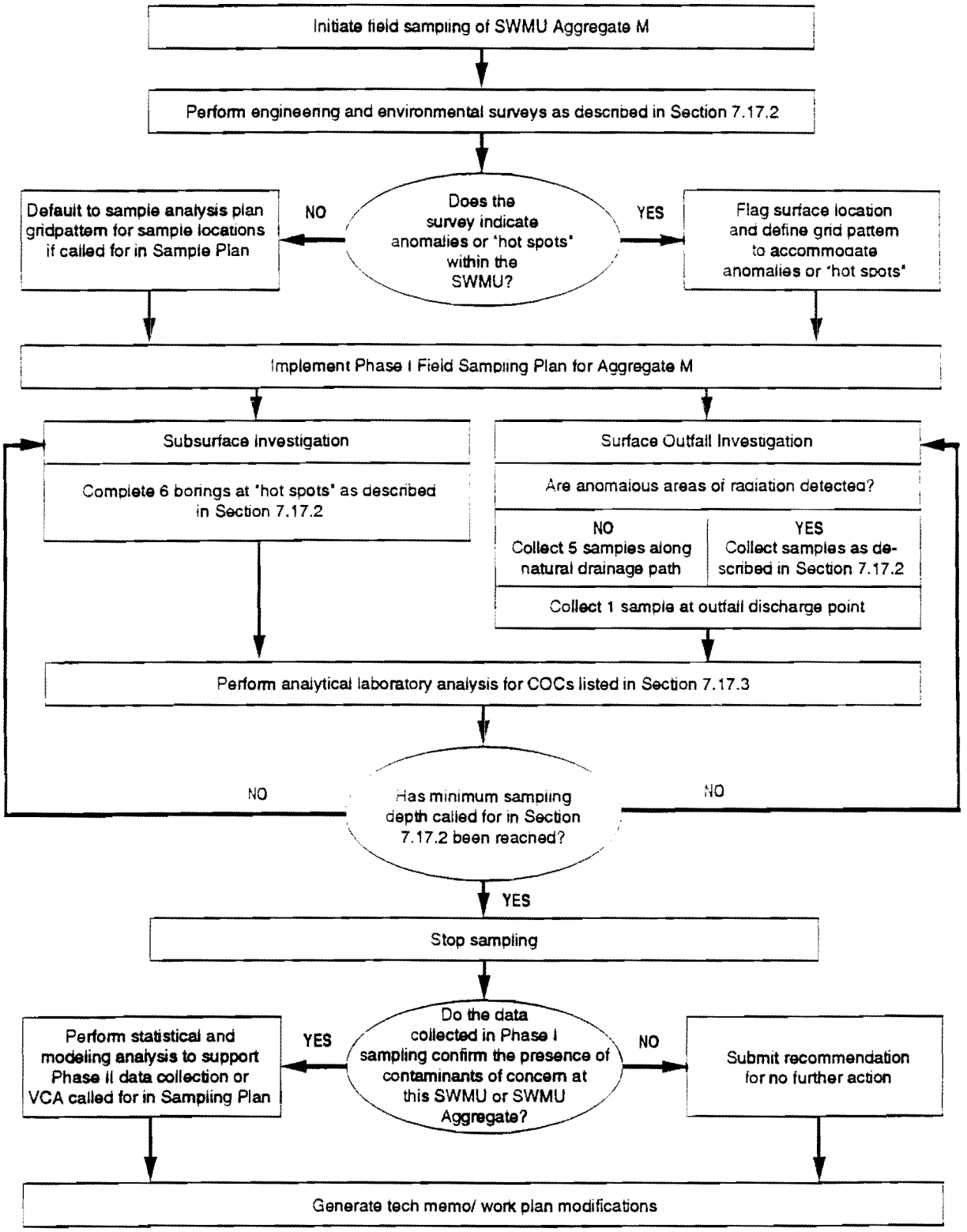


Figure 7-37. Decision logic for the sampling and analysis of SWMU Aggregate M.

location of the former filter bed. The surface core samples will be used to determine the effectiveness of the 1986 D&D and to ascertain residual contamination.

The borings will be drilled and sampled at 5-ft intervals, or 2 intervals below which above-background measurements are no longer detected. If no contamination is present, drilling will stop. Appendix B contains the procedures for decontaminating sampling and drilling equipment, and for collecting soil and rock samples with a split-barrel core.

Collected samples will be screened for radioactivity and submitted to the laboratory for analyses. Samples will be analyzed for gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy; VOCs; SVOCs; and metals (Table 7-16).

SWMU No. 48-003, Outfall – Surface and Subsurface Investigations

Samples will be collected from the outfall area in which potential contamination would most likely concentrate. The former outfall, also designated as SWMU No. 48-003, received effluent from the septic tank and filter bed. Little is known about potential contaminants that may have discharged through the outfall; however, the septic system is suspected to have received hazardous chemicals and radionuclides.

The outfall discharged to a natural bare rock drainage area on the north-facing slope of Mortandad Canyon. Contamination is expected to be minimal in this area because the majority of the effluent volume probably flowed down the slope into the canyon. The objective of the outfall area sampling will be to determine the presence of potential contaminants along the trace of the outfall to the toe of the slope.

First, the outfall area will be screened with a scintillation detector to identify anomalous areas of above-background radiation. If anomalous areas are detected, five surface samples locations will be selected. If anomalous areas are not identified, five samples will be selected along the path of the natural drainage channel in which remnant contamination is the most likely to accumulate.

One surface soil **from 0 to 6 in.** or rock core sample will be collected from the outfall discharge point. Two surface soil or rock core samples will be collected from the drainage channel, and two samples will be collected at the toe of the slope (Figure 7-36). This area is being sampled because it is assumed to most likely have residual contamination. Samples will either be collected with a stainless-steel trowel for soil, or with a hammer and chisel for rock chips.

Samples will be analyzed for gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy; metals; **VOCs;** and SVOCs (Table 7-16). If contamination is detected, additional investigation will be necessary.

7.17.3 Sample Screening and Analysis

Each sample collected will be screened with scintillation detector for contact radiation. All sample packages must be screened for surface contamination and contact radiation. Subsection 2.1 of Appendix B contains a discussion of field screening procedures. All samples will be analyzed for gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectrometry; SVOCs; and metals listed in Table V.8

of the ER Program Generic QAPjP. The soil boring samples collected from the leach field will also be analyzed for VOCs. Table 7-16 outlines the total number of matrix and QA/QC samples required for this field investigation, the corresponding analyses, and sample requirements.

TABLE 7-16

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE M

			Analyses Required *							
SWMU	SAMPLE NUMBER	DEPTH	Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
48-003	M48-2010-B1	0-5 ft	1	1	1	1	1	1	0	0
	M48-2010-B2	5-10 ft	1	1	1	1	1	1	0	0
	M48-2010-B3	10-15 ft	1	1	1	1	1	1	0	0
	M48-2011-B1	0-5 ft	1	1	1	1	1	1	0	0
	M48-2011-B2	5-10 ft	1	1	1	1	1	1	0	0
	M48-2011-B3	10-15 ft	1	1	1	1	1	1	0	0
	M48-2012-B1	0-5 ft	1	1	1	1	1	1	0	0
	M48-2012-B2	5-10 ft	1	1	1	1	1	1	0	0
	M48-2012-B3	10-15 ft	1	1	1	1	1	1	0	0
	M48-2013-B1	0-5 ft	1	1	1	1	1	1	0	0
	M48-2013-B2	5-10 ft	1	1	1	1	1	1	0	0
	M48-2013-B3	10-15 ft	1	1	1	1	1	1	0	0
	M48-2014-B1	0-5 ft	1	1	1	1	1	1	0	0
	M48-2014-B2	5-10 ft	1	1	1	1	1	1	0	0
	M48-2014-B3	10-15 ft	1	1	1	1	1	1	0	0
	M48-2015-B1	0-5 ft	1	1	1	1	1	1	0	0
	M48-2015-B2	5-10 ft	1	1	1	1	1	1	0	0
	M48-2015-B3	10-15 ft	1	1	1	1	1	1	0	0
	M48-2016-S1	surface	1	1	1	1	0	1	0	0
	M48-2017-S1	surface	1	1	1	1	0	1	0	0
	M48-2018-S1	surface	1	1	1	1	0	1	0	0
	M48-2019-S1	surface	1	1	1	1	0	1	0	0
	M48-2020-S1	surface	1	1	1	1	0	1	0	0
Rinsate Blanks			2	2	2	2	1	2	0	0
Bottle Blanks			2	2	2	2	1	2	0	0
Trip Blanks			0	0	0	0	1	0	0	0
Duplicates			2	2	2	2	1	2	0	0
TOTALS			29	29	29	29	22	29	0	0

*Section 5.0 ofthe Generic Quality Assurance (QA) Project Plan for RCRA Facility Investigations for the LANL ER Program (LANL 1991, 0843), includes U.S. EPASolid Waste (SW) 846 quantitative and detection limits for the various required analytes.

7.18 SWMU Aggregate N, Phase I

SWMU Aggregate N contains SWMU No. 48-005, which includes abandoned radioactive waste lines 34, 36, and 38 located north of Pajarito Road. SWMU No. 48-005 was listed in the HSWA Module VIII (EPA 1990, 0306) (Table 1-1). Remaining portions of these lines, which are located within the TA-48 security fence, vary in length from 100 ft at line 34, 300 ft at line 36, and 50 ft at line 38. Also associated with SWMU No. 48-005 is an outfall originating from line 37, which was completely removed in 1981. Figure 7-38 depicts the location of SWMU No. 48-005. A detailed description of the location, site activities, and history of SWMU No. 48-005 within OU 1129 is found in Section 3.5 of this Work Plan.

7.18.1 Sampling Plan Rationale and Objectives

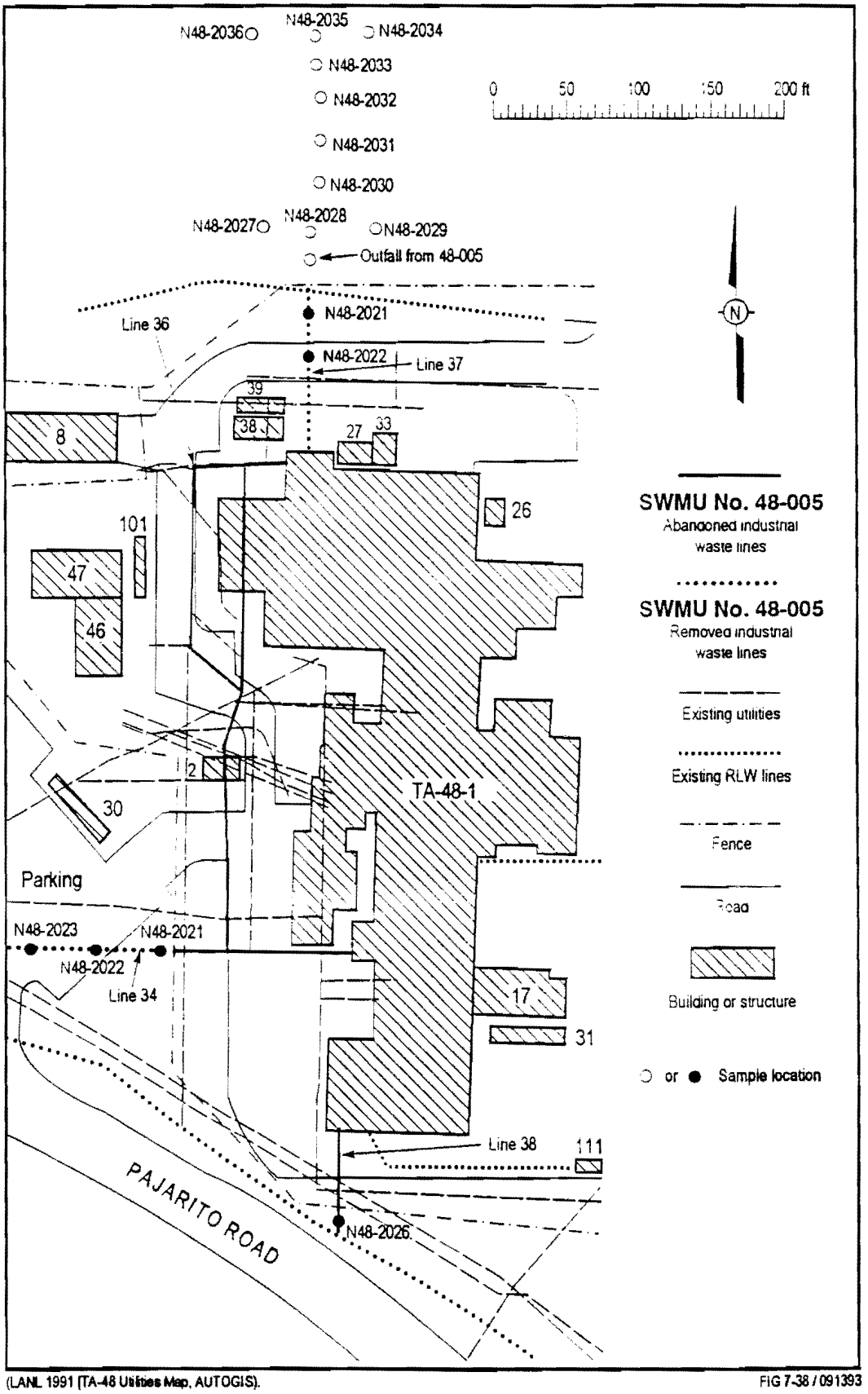
The objective of this Phase I sampling plan is to determine the presence or absence of surface and subsurface contamination. This sampling plan uses a judgmental sampling approach to investigate the waste lines and outfall at SWMU No. 48-005. Sampling activities are biased toward areas at which residual contamination is most likely to be present on the basis of the following conceptual model for a release at this site:

- Any remaining COCs are thought to be localized in the proximity of the former line trenches.
- Previous D&D activity may not have cleaned the line traces to background.
- The waste stream is not defined; therefore, initial sample locations will conduct analysis for a wide range of potential COCs. Results from these initial samples will then be used to structure the Phase II sampling analyte suite.

The surface investigation at Aggregate N is designed primarily to answer the following questions:

1) Does surface and subsurface contamination currently exist in Aggregate N?
2) Are there any near-surface artifacts remaining that represent potential contaminant release points?
3) What is the potential for surface and subsurface migration of contaminants?
4) What are the **past** waste stream constituents?

Archival information indicates that the industrial waste lines, SWMU No. 48-005, were used to transport liquid wastes containing radionuclides and chemicals from TA-48 to a chemical waste treatment plant at TA-45 (Chapter 3.0). The remaining line segments located inside the security fence were not removed "due to the location of the pipes and low levels of contamination" (Elder et al. 1986, 0456). Therefore, the Phase I investigation will be limited to sampling the area around the former waste lines outside the security fence, former waste lines at the west and south perimeter of building TA-48-1, former waste lines to the north of building TA-48-1 within the security fence, and the outfall discharge area.



(LANL 1991 [TA-48 Utilities Map, AUTOGIS]). FIG 7-38 / 091393

Figure 7-38. Schematic sample location map for SWMU 48-005, Aggregate N.

A decision logic diagram for Phase I field investigation activities to be conducted at SWMU Aggregate N is presented in Figure 7-39 and discussed in the following text.

7.18.2 Phase I Field Investigation Activities

The technical approach for the Phase I assessment of SWMU No. 48-005 will consist of four tasks. These tasks include the engineering survey and environmental surveys described in Section 7.4; test pitting and subsurface sampling of the abandoned industrial waste line areas; and surface sampling of the outfall area (Figure 7-38).

During the engineering survey the former industrial waste lines and the outfall, the locations of former industrial waste lines 34 and 37, and the endpoint of remaining line 38 will be identified and marked with stakes (Figure 7-38). Test pits along the trace of lines 34 and 37, and a point at the end of line 38 will also be located and staked. The radiation survey will be conducted along the trace of these industrial waste lines to identify potential radiological anomalies at the site. Stationary radiological counts for a duration of one minute will be collected at random points along the trace of these waste lines using a FIDLER.

SWMU No. 48-005, Waste Lines – Subsurface Investigation

Portions of lines 34 and 38 located outside the security fence and all of line 37 located inside the security fence of TA-48 were decontaminated and decommissioned for radioactivity in 1981 and 1984. The industrial waste lines were located at depths ranging from 7 to 11 ft. Contamination at this SWMU is expected to consist of low-level radioactivity and hazardous chemicals.

Once the area is surveyed and anomalies are identified, six test pits will be excavated normal to the trace of the industrial waste lines. First, three test pits will be located along the western end of former line 34, two test pits will be located along the northern end of former line 37, and one test pit will be located at the southern end of former line 38. The test pits will either be located at anomalous areas identified during the field surveys, or at the previously selected points shown in Figure 7-38. The purpose of the test pits is to determine the effectiveness of the 1981 and 1984 D&D activities, and to ascertain the presence or absence of residual contamination. The test pits will be excavated to the approximate depth of the former waste line (between 7 and 11 ft) or to a maximum depth of 12 ft with a decontaminated back hoe. Soil from the excavated test pits will be screened with a scintillation detector and an OVA. One soil sample will be collected from each test pit at anomalous areas identified during the radiation and surveys. If no anomalies are identified during the field surveys, samples will be collected from the approximate depth of the former waste line (i.e., the fill/natural soil contact).

Soil will be placed in the appropriate sample containers using a stainless-steel trowel. Collected samples will be screened for radioactivity and submitted to the laboratory for analysis. **All collected samples will be screened with the appropriate OVA, FID, or PID field instruments for VOCs. If VOCs are indicated, then a discrete sample will be collected and analyzed for VOCs.** Samples will be analyzed for SVOCs; gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy; and metals (Table 7-17). The total number of subsurface soil samples for the Phase I investigation is six per method.

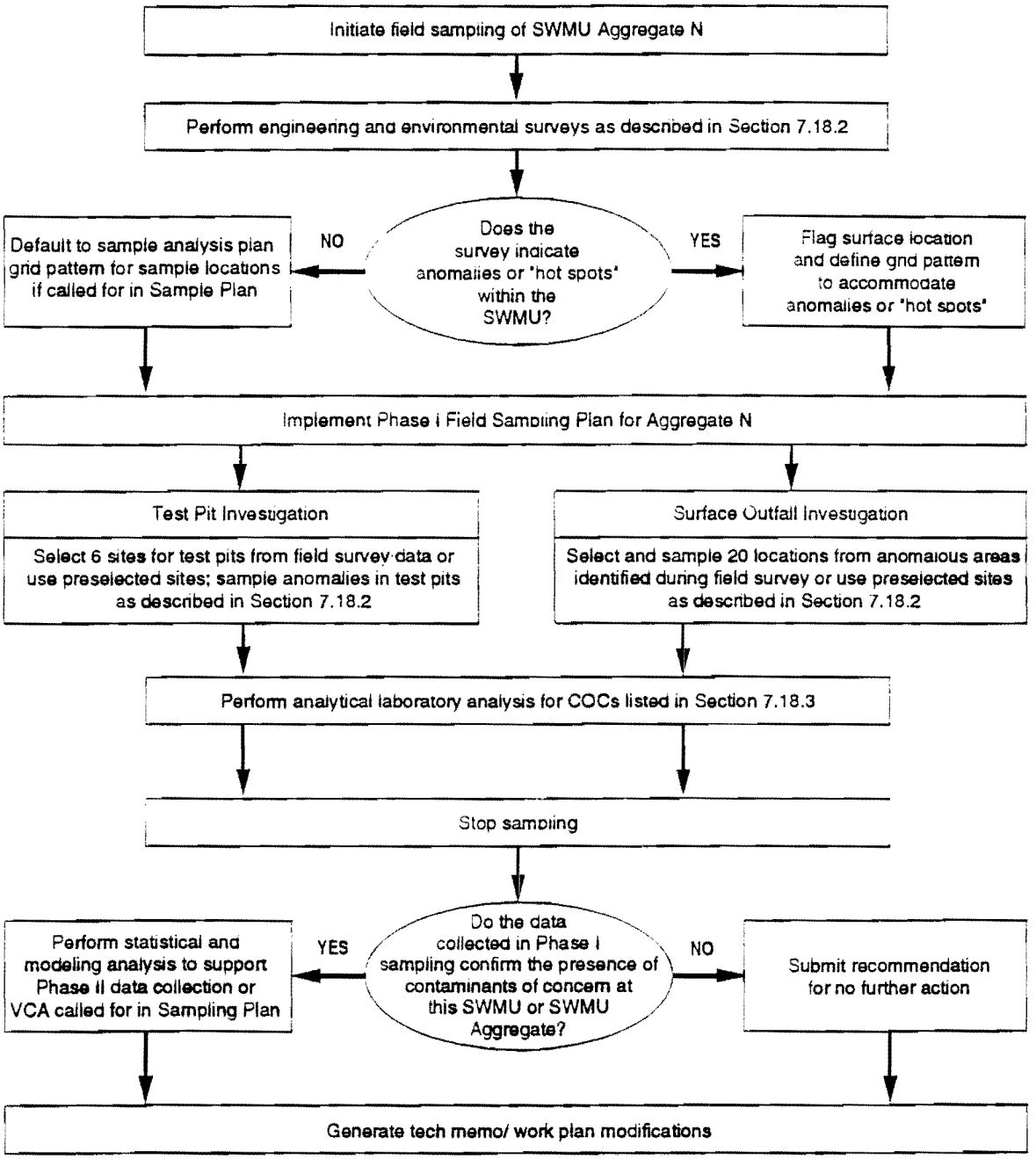


Figure 7-39. Decision logic for the sampling and analysis of SWMU Aggregate N.

TABLE 7-17

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE N

			Analyses Required *							
SWMU	SAMPLE NUMBER	DEPTH	Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
48-005	N48-2021-B1	0-5 ft	1	1	1	1	**	1	0	0
	N48-2021-B2	5-10 ft	1	1	1	1	**	1	0	0
	N48-2021-B3	10-15 ft	1	1	1	1	**	1	0	0
	N48-2022-B1	0-5 ft	1	1	1	1	**	1	0	0
	N48-2022-B2	5-10 ft	1	1	1	1	**	1	0	0
	N48-2022-B3	10-15 ft	1	1	1	1	**	1	0	0
	N48-2023-B1	0-5 ft	1	1	1	1	**	1	0	0
	N48-2023-B2	5-10 ft	1	1	1	1	**	1	0	0
	N48-2023-B3	10-15 ft	1	1	1	1	**	1	0	0
	N48-2024-B1	0-5 ft	1	1	1	1	**	1	0	0
	N48-2024-B2	5-10 ft	1	1	1	1	**	1	0	0
	N48-2024-B3	10-15 ft	1	1	1	1	**	1	0	0
	N48-2025-B1	0-5 ft	1	1	1	1	**	1	0	0
	N48-2025-B2	5-10 ft	1	1	1	1	**	1	0	0
	N48-2025-B3	10-15 ft	1	1	1	1	**	1	0	0
	N48-2026-B1	0-5 ft	1	1	1	1	**	1	0	0
	N48-2026-B2	5-10 ft	1	1	1	1	**	1	0	0
	N48-2026-B3	10-15 ft	1	1	1	1	**	1	0	0
	N48-2027-S1	surface	1	1	1	1	**	1	0	0
	N48-2028-S1	surface	1	1	1	1	**	1	0	0
	N48-2029-S1	surface	1	1	1	1	**	1	0	0
	N48-2030-S1	surface	1	1	1	1	**	1	0	0
	N48-2031-S1	surface	1	1	1	1	**	1	0	0
	N48-2032-S1	surface	1	1	1	1	**	1	0	0
	N48-2033-S1	surface	1	1	1	1	**	1	0	0
	N48-2034-S1	surface	1	1	1	1	**	1	0	0
	N48-2035-S1	surface	1	1	1	1	**	1	0	0
	N48-2036-S1	surface	1	1	1	1	**	1	0	0
Rinsate Blanks			1	1	1	1	**	1	0	0
Bottle Blanks			1	1	1	1	**	1	0	0
Trip Blanks			0	0	0	0	**	0	0	0
Duplicates			1	1	1	1	**	1	0	0
TOTALS			31	31	31	31	0	31	0	0

*Section 5.0 ofthe Generic Quality Assurance (QA) Project Plan for RCRA Facility Investigations for the LANL ER Program (LANL 1991, 0843), includes U.S. EPASolid Waste (SW) 846 quantitative and detection limits for the various required analytes.

** A discrete sample will be collected and analyzed for VOCs only if VOCs are first detected using the appropriate OVA, FID, or PID field instrument.

SWMU No. 48-005, Outfall – Surface Investigation

The outfall originated at line 37 and ran from the north end of TA-48-1 northward to the canyon. The nature of the outfall effluent is unknown; however, radioactivity and hazardous chemicals are suspected to have been discharged. The discharge channel from this outfall was not investigated during the 1981 and 1984 D&D activities conducted at TA-48. Therefore, the area in proximity to the outfall as identified during the engineering survey will be sampled (Figure 7-38).

First, the area north of TA-48-1 in the vicinity of former line 37 will be screened with a scintillation detector to locate the outfall. The soil and rock in this area will be investigated for evidence of drainage channeling. Ten surface soil/rock samples will be collected at radiological anomalies identified during the field survey. If no anomalies are identified, channels will be sampled along the trace of the outfall to the toe of the slope as shown in Figure 7-38. Sample locations will be selected on the basis of potential for accumulation of residual contamination. The objective of the Phase I outfall sampling is to identify the former SWMU location and to ascertain the presence of residual contamination along the trace of the outfalls from the mesa top to the toe of the slope (Figure 7-38).

Three surface soil/rock samples will be collected from the immediate outfall discharge area, five samples will be collected from the channel, and two samples will be collected at the toe of the slope (Figure 7-38). Surface sample locations will be selected in the field on the basis of above-background measurements obtained during the radiation survey. If no anomalies are found, sample locations will be located at natural features at which residual contamination would likely accumulate. Samples will either be collected with a stainless-steel trowel **from 0 to 6 in. beneath the surface** for soil or by collecting rock chip samples with a hammer and chisel (see Appendix B for sampling procedures).

Samples will be analyzed for gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectrometry; metals; and SVOCs (Table 7-17). VOCs will not be analyzed because of volitilization that occurs at the rock surface. If monitoring instruments detect contamination, additional investigation will be necessary.

7.18.3 Sample Screening and Analysis

Each sample collected will be screened with a scintillation detector for contact radiation. All sample packages must be screened for surface contamination and contact radiation. Subsection 2.1 of Appendix B contains a discussion of field screening. **All collected test pit samples will be screened with the appropriate OVA, FID, or PID field instruments for VOCs. If VOCs are indicated, then a discrete sample will be collected and analyzed for VOCs.** All samples will be analyzed for SVOCs; metals; gross-alpha, -beta, -gamma; gamma spectrometry; and alpha spectroscopy.

Table 7-17 outlines the total number of matrix and QA/QC samples required for this field investigation, the corresponding analyses, and sample requirements.

7.19 SWMU Aggregate O, Phase I

SWMU Aggregate O consists of SWMU Nos. 52-002(a) and 52-003(a), located on the north side of Puye Road. SWMU No. 52-002(a) and SWMU No. 52-003(a) are listed in the HSWA Module VIII (EPA 1990, 0306) (Table 1-1). The original SWMU numbers were 52-002(b, c, e, f, g, h, i, and j); these have been recommended for NFA in Chapter 6. SWMU No. 52-002(a) is an active septic system that has served the Ultra-High-Temperature Reactor Experiment (UHTREX) Building, TA-52-1, since 1965. The septic system is composed of septic tank TA-52-3, distribution box TA-52-4, and a trench for a tile drain field leach system. SWMU No. 52-003(a) is the former location of TA-52-2, the waste treatment facility in which liquid acid wastes from the UHTREX reactor facility were neutralized before being piped to TA-50. The waste treatment facility was removed in 1989 during the UHTREX D&D project. Figure 7-40 depicts the location of the SWMUs. A detailed description of the location, site activities, and history of these SWMUs within OU 1129 is found in Section 3.6 of this Work Plan.

7.19.1 Sampling Plan Rationale and Objectives

The objective of the Phase I sampling of these SWMUs is to determine if subsurface soil contamination at the septic system (SWMU No. 52-002[a]) and the former waste treatment facility (SWMU No. 52-003[a]) is present. This sampling plan uses a judgmental sampling approach to investigate the SWMUs in Aggregate O. Sampling activities are biased toward areas in which residual contamination is likely to be present on the basis of the following conceptual model for a release at this site:

- Previous environmental surveys have shown no radioactivity above background. No environmental surveys have been conducted for other COCs.
- The content of the waste stream at these sites is not defined. Therefore, samples will be analyzed for a wide range of potential COCs, and the results of those analyses will be used to structure the analytical suite for Phase II.
- If present, contaminant plumes may have moved vertically (along fracture planes that are in contact with the leach fields and outfalls) along the path of the waste stream.

The surface investigation at Aggregate O is designed primarily to answer the following questions:

1) Does surface and subsurface contamination currently exist in Aggregate O?
2) What is the potential for surface and subsurface migration of contaminants?
3) What are the waste stream constituents?

Archival information indicates that the former waste treatment facility received liquid radioactive wastes from the UHTREX facility. This waste stream may have contained various solvents and inorganic wastes. The active septic system receives primarily sanitary wastes from UHTREX, but solvents, chemicals, and radionuclides may have been introduced to the system in the past. In this investigation, sampling of

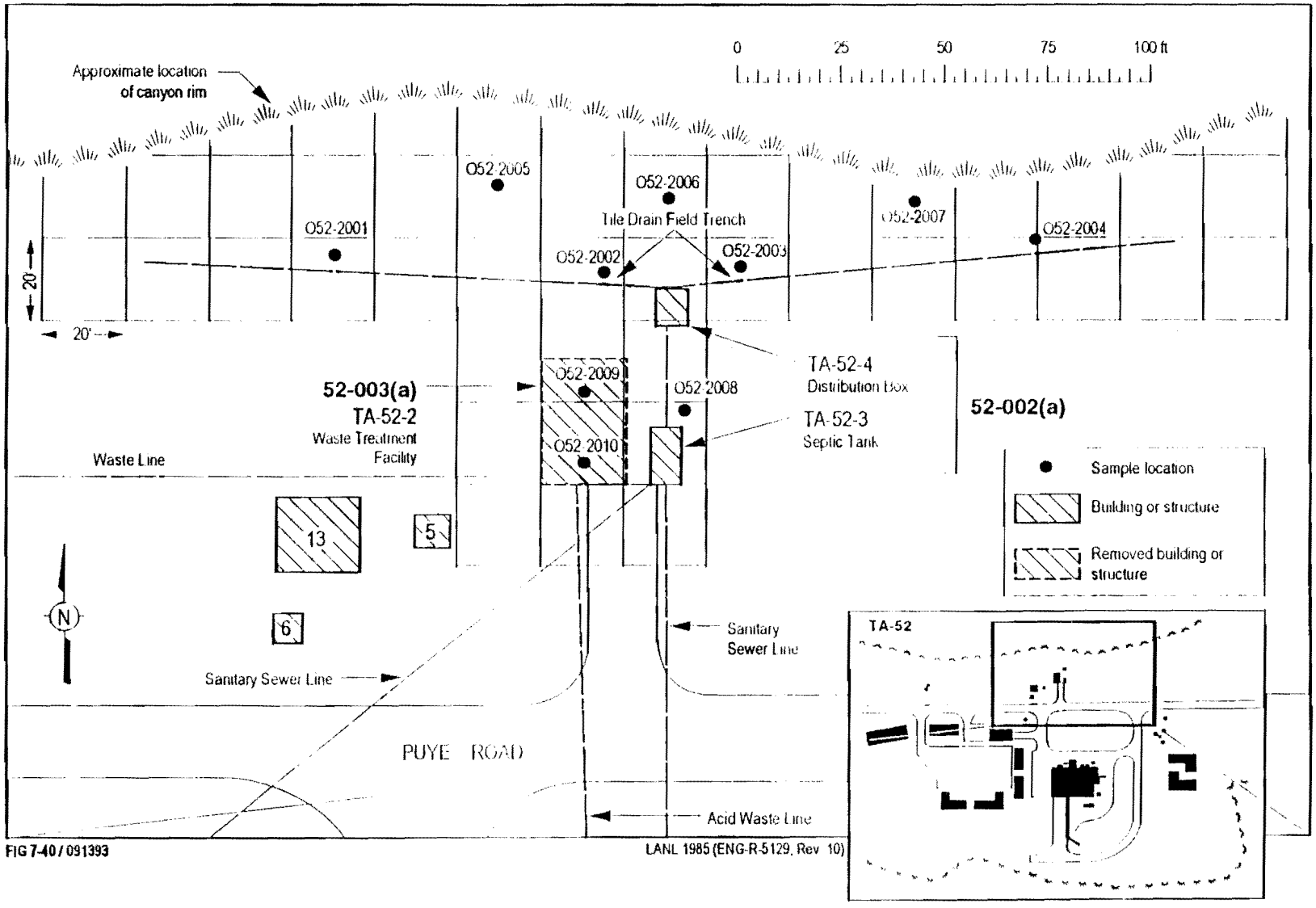


Figure 7-40. Schematic sample location map for SWMUs 52-002(a) and 52-003(a), Aggregate O.

subsurface soils and/or tuff beneath the septic tank, the trench for the former tile drain field, and the former waste treatment facility location will be conducted.

Decision logic for Phase I field investigations activities to be conducted at SWMU Aggregate O is presented in Figure 7-41 and discussed in the following text.

7.19.2 Phase I Field Investigation Activities

The Phase I investigation of Aggregate O will consist of three tasks. These tasks include the engineering survey and environmental surveys discussed in Section 7.4, and subsurface sampling of the active septic system and former waste treatment facility (Figure 7-40).

The engineering survey will locate the former waste treatment facility and the tile drain field trench and will verify the locations of the septic tank and distribution box. A sampling grid will be surveyed to encompass a T-shaped area consisting of two adjacent rectangular areas; one with dimensions 60 ft by 60 ft and the other with dimensions 300 ft by approximately 60 ft The sampling grid, which extends to the canyon edge, is designed to evaluate the areas potentially affected by SWMU Nos. 52-002(a) and 52-003(a) (Figure 7-40). Individual grid blocks will be 20 ft by 20 ft The radiation survey will be conducted over the grid area. The grid will also be used to survey for the presence of VOCs using a PID. In addition, stationary radiological counts for a duration of one minute will be collected in the center of each grid block using a FIDLER.

SWMU No. 52-002(a), Active Septic System – Subsurface Investigation

SWMU No. 52-002(a) consists of a septic tank TA-52-3, a distribution box TA-52-4, and a tile drain field trench. The system was installed in 1965 and is currently active. According to engineering drawings, overflow from the 2,580-gal. septic tank is diverted to a 300-ft-long tile drain trench with a 4-in.-diameter pipe. Radiation screening conducted in 1988 at SWMU No. 52-002(a) did not exceed background levels. On the basis of these results and because all structures associated with SWMU No. 52-002(a) are located in the subsurface, surface samples will not be collected as part of this plan unless anomalously high radiation or VOC readings are detected during the environmental surveys.

Eight soil boring locations will be selected as shown in Figure 7-40. The purpose of soil borings **52-2001 through 52-2004** is to assess potential subsurface contamination in the area of the tile drain field trench. Borings **52-2005 through 52-2007** are placed near the canyon edge down the slope from the drain field to assess potential migration of contaminants from the drain field. Soil boring **52-2008** is located 5 ft north of the septic tank to assess potential leakage from the tank and will only be drilled if COCs are discovered in the leach field. Additional boreholes may be installed at anomalous areas identified within the grid during the environmental surveys.

All eight soil borings will be installed to a minimum depth of 20 ft using a decontaminated continuous 5-ft core barrel. As the 5-ft sections of core are retrieved from the borehole using a wireline, the solid and/or rock will be screened for radioactivity with a scintillation detector, and for VOCs with a PID. Screening measurements will be recorded on the field log. If preliminary surveys indicate the presence of VOCs above

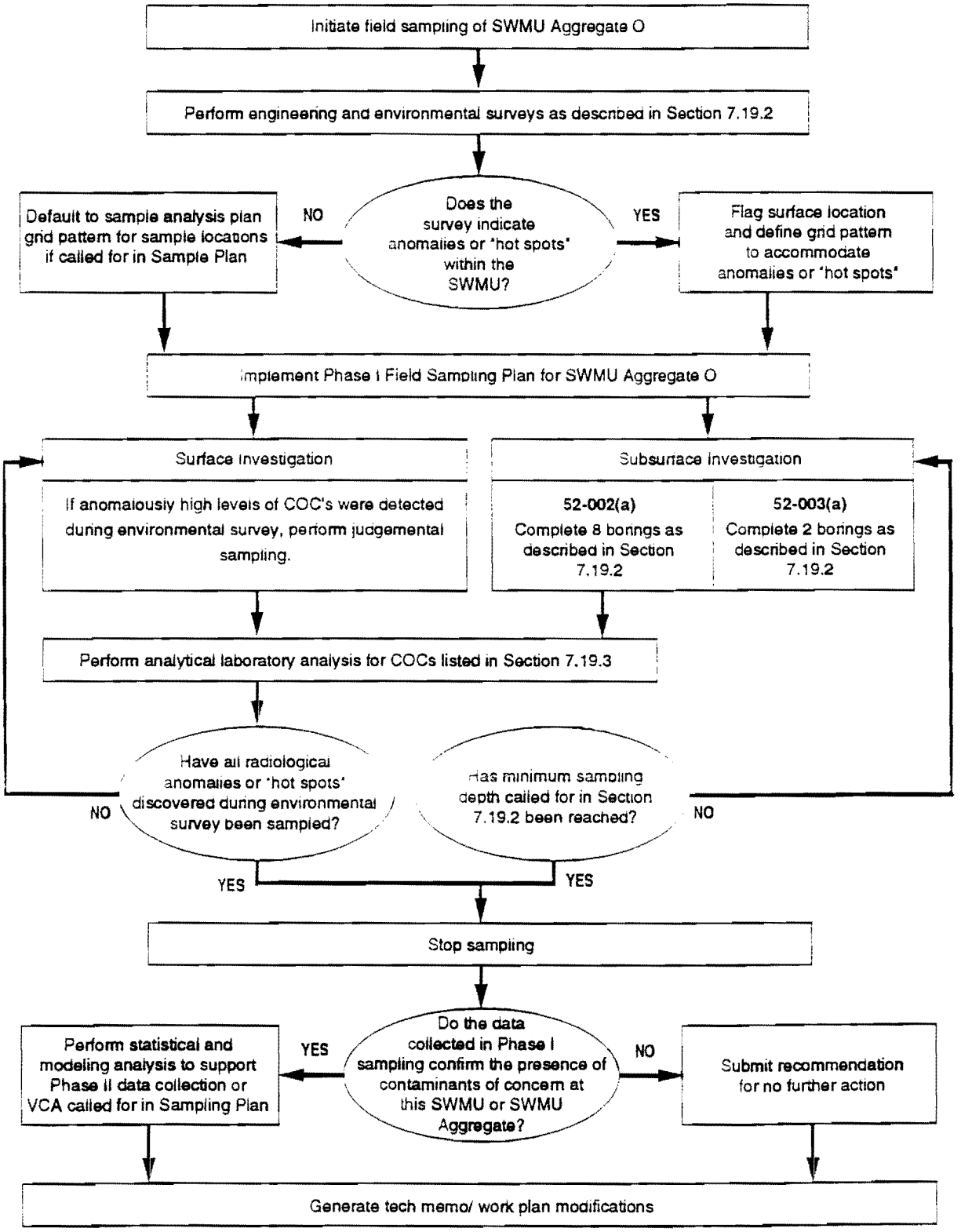


Figure 7-41. Decision logic for the sampling and analysis of SWMU Aggregate O.

detection limits or above-background radioactivity, samples will be collected from points with the highest screening readings. If no above-background contamination is detected, the midpoint of each core interval will be sampled. Assuming a total depth of 20 ft, soil borings **52-2001 through 52-2007** will be sampled at 4 intervals (i.e., 0 to 5 ft, 5 to 10 ft, 10 to 15 ft, and 15 to 20 ft). Assuming a total depth of 20 ft, boring **52-2008** will be sampled at 3 intervals (5 to 10 ft, 10 to 15 ft, and 15 to 20 ft). If contamination is found in the last core interval, the borings will continue until 2 intervals indicate no above-background measurements. Appendix B contains the procedures for decontaminating sampling and drilling equipment, and for collecting soil and rock samples with a split-barrel core.

Collected samples will be screened for radioactivity and submitted to the laboratory for analyses. Samples will be analyzed for VOCs; SVOCs; metals; gross-alpha, -beta, -gamma; gamma spectrometry; and alpha spectroscopy.

SWMU No. 52-003(a), Waste Treatment Facility – Subsurface Investigation

SWMU No. 52-003, the waste treatment facility, was decontaminated and decommissioned in 1989. According to a Laboratory report on the decommissioning of the UHTREX Reactor Facility, surface soils near the former waste treatment facility were excavated below the foundation to solid tuff, the area was then backfilled, graded, and revegetated (Salazar and Elder 1992, 04-0296). On the basis of this information, the investigation will not address surface sampling.

Two soil boring locations, **52-2009 and 52-2010**, will be selected as shown in Figure 7-40. The purpose of these two soil borings is to assess potential subsurface contamination beneath the former waste treatment facility site. A primary concern is the potential leakage of liquid waste from two concrete waste holding tanks that were installed into the ground on the north side of the facility. Additional boreholes may be installed at anomalous areas identified during the environmental surveys. Soil borings will be installed to minimum depth of 20 ft using a decontaminated continuous 5-ft core barrel. As the 5-ft sections of core are retrieved from the borehole using a wireline, the soil and/or rock will be screened with a scintillation detector and a PID. Screening measurements will be recorded on the field log. Soil will be sampled from intervals with the greatest above-background contamination. If no above-background contamination is detected, the midpoint of each core interval will be sampled. Because soil in the area was previously excavated to tuff and backfilled, sample collection will begin at the soil/tuff interface and will continue for two core intervals.

If contamination is found in the last core interval, the borings will be drilled to a total depth of 40 ft, sampling at 5-ft intervals, **or until contaminants are below background for 2-consecutive intervals**. Appendix B contains the procedures for decontaminating sampling and drilling equipment, and for collecting soil and rock samples with a split-barrel core.

Collected samples will be screened for radioactivity and submitted to the laboratory for analyses. **All collected samples will be screened with the appropriate OVA, FID, or PID field instruments for VOCs. If VOCs are indicated, then a discrete sample will be collected and analyzed for VOCs.** Samples will be analyzed for SVOCs; gross-alpha, -beta, -gamma; gamma spectrometry; alpha spectroscopy; and metals (Table 7-18).

7.19.3 Sample Screening and Analysis

Each sample collected will be screened with a Geiger-Mueller Meter and scintillation detector for contact radiation. All sample packages must be screened for surface contamination and contact radiation. All samples will be analyzed for VOCs; SVOCs; metals; gross-alpha, -beta, -gamma; gamma spectrometry; and alpha spectroscopy.

Table 7-18 outlines the total number of matrix and QA/QC samples required for this field investigation, the corresponding analyses, and sample requirements.

TABLE 7-18

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE O

			Analyses Required *							
SWMU	SAMPLE NUMBER	DEPTH	Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil
52-002 (a)	O52-2001-B1	0-5 ft	1	1	1	1	1	1	0	0
	O52-2001-B2	5-10 ft	1	1	1	1	1	1	0	0
	O52-2001-B3	10-15 ft	1	1	1	1	1	1	0	0
	O52-2001-B4	15-20 ft	1	1	1	1	1	1	0	0
	O52-2002-B1	0-5 ft	1	1	1	1	1	1	0	0
	O52-2002-B2	5-10 ft	1	1	1	1	1	1	0	0
	O52-2002-B3	10-15 ft	1	1	1	1	1	1	0	0
	O52-2002-B4	15-20 ft	1	1	1	1	1	1	0	0
	O52-2003-B1	0-5 ft	1	1	1	1	1	1	0	0
	O52-2003-B2	5-10 ft	1	1	1	1	1	1	0	0
	O52-2003-B3	10-15 ft	1	1	1	1	1	1	0	0
	O52-2003-B4	15-20 ft	1	1	1	1	1	1	0	0
	O52-2004-B1	0-5 ft	1	1	1	1	1	1	0	0
	O52-2004-B2	5-10 ft	1	1	1	1	1	1	0	0
	O52-2004-B3	10-15 ft	1	1	1	1	1	1	0	0
	O52-2004-B4	15-20 ft	1	1	1	1	1	1	0	0
	O52-2005-B1	0-5 ft	1	1	1	1	1	1	0	0
	O52-2005-B2	5-10 ft	1	1	1	1	1	1	0	0
	O52-2005-B3	10-15 ft	1	1	1	1	1	1	0	0
	O52-2005-B4	15-20 ft	1	1	1	1	1	1	0	0
	O52-2006-B1	0-5 ft	1	1	1	1	1	1	0	0
	O52-2006-B2	5-10 ft	1	1	1	1	1	1	0	0
	O52-2006-B3	10-15 ft	1	1	1	1	1	1	0	0
	O52-2006-B4	15-20 ft	1	1	1	1	1	1	0	0
	O52-2007-B1	0-5 ft	1	1	1	1	1	1	0	0
	O52-2007-B2	5-10 ft	1	1	1	1	1	1	0	0
	O52-2007-B3	10-15 ft	1	1	1	1	1	1	0	0
	O52-2007-B4	15-20 ft	1	1	1	1	1	1	0	0
	O52-2008-B1	5-10 ft	1	1	1	1	1	1	0	0
	O52-2008-B2	10-15 ft	1	1	1	1	1	1	0	0
	O52-2008-B3	15-20 ft	1	1	1	1	1	1	0	0
52-003 (a)	O52-2009-B1	0-5 ft	1	1	1	1	**	1	0	0
	O52-2009-B2	5-10 ft	1	1	1	1	**	1	0	0
	O52-2009-B3	10-15 ft	1	1	1	1	**	1	0	0
	O52-2009-B4	15-20 ft	1	1	1	1	**	1	0	0
	O52-2010-B1	0-5 ft	1	1	1	1	**	1	0	0
	O52-2010-B2	5-10 ft	1	1	1	1	**	1	0	0
	O52-2010-B3	10-15 ft	1	1	1	1	**	1	0	0
	O52-2010-B4	15-20 ft	1	1	1	1	**	1	0	0
Rinsate Blanks			2	2	2	2	2	2	0	0
Bottle Blanks			2	2	2	2	2	2	0	0
Trip Blanks			0	0	0	0	1	0	0	0
Duplicates			2	2	2	2	2	2	0	0
TOTALS			45	45	45	45	38	45	0	0

*Section 5.0 ofthe Generic Quality Assurance (QA) Project Plan for RCRA Facility Investigations for the LANL ER Program (LANL 1991, 0843), Includes U.S. EPASolid Waste (SW) 846 quantitative and detection limits for the various required analytes.

** A discrete sample will be collected and analyzed for VOCs only if VOCs are first detected using the appropriate OVA, FID, or PID field instrument.

7.20 SWMU Aggregate P, Phase I

SWMU Aggregate P contains SWMU Nos. 63-001(a and b), two active septic systems. Both SWMUs are currently located within the boundaries of TA-63. Before the establishment of TA-63 in 1989, both of these SWMUs were within the boundaries of TA-52. SWMU No. 63-001(a) was formerly numbered SWMU Nos. 52-002(f and g) and was listed on the HSWA Module VIII (LANL 1990, 0306) under those numbers (Table 1-1). SWMU No. 63-001(b) was formerly numbered SWMU No. 52-002(k) and was listed on the HSWA Module VIII under that designation. Figure 7-42 presents the locations of SWMU Nos. 63-001(a and b). A detailed description of the site activities and history of SWMU Nos. 63-001(a and b) within OU 1129 is found in Section 3.8 of this Work Plan.

7.20.1 Sampling Plan Rationale and Objectives

The objective of this Phase I sampling plan is to determine the presence or absence of subsurface contamination in the vicinity of the SWMUs in Aggregate P. The sampling plan uses a judgmental sampling approach to investigate SWMU No. 63-001(a), a 1,000-gal. septic tank with associated drain line and seepage pit, and SWMU No. 63-001(b), a 920-gal. septic tank with associated drain line and seepage pit. Sampling activities are biased toward areas in which residual contamination is most likely to be present on the basis of the following conceptual model for a release at this site:

- Previous environmental surveys have shown no radioactive anomalies. No environmental surveys have been conducted for other COCs.
- The content of the waste stream is not defined. Therefore, initial sample locations will be analyzed for a wide range of potential COCs. If positive results are obtained from these initial analyses, the information will be used to structure the sample analyte suite for Phase II.
- Contaminant plumes may have moved vertically along fractures that intersect leach fields and outfalls in liquids associated with the waste stream.

The surface investigation at Aggregate P is designed primarily to answer the following questions:

1) Does surface and subsurface contamination currently exist in Aggregate P?
2) What is the potential for surface and subsurface migration of contaminants?
3) What are the waste stream constituents?

Archival information indicates that the contaminants suspected at SWMU Nos. 63-001(a and b) include organic solvents and hazardous chemicals. Radionuclides are not expected at this site, but analysis will be conducted to determine if radionuclides are present. Both systems receive only sanitary waste; however, solvents and other chemicals may have been discharged into the systems in previous years.

In this investigation. subsurface sampling will be conducted in the immediate vicinity

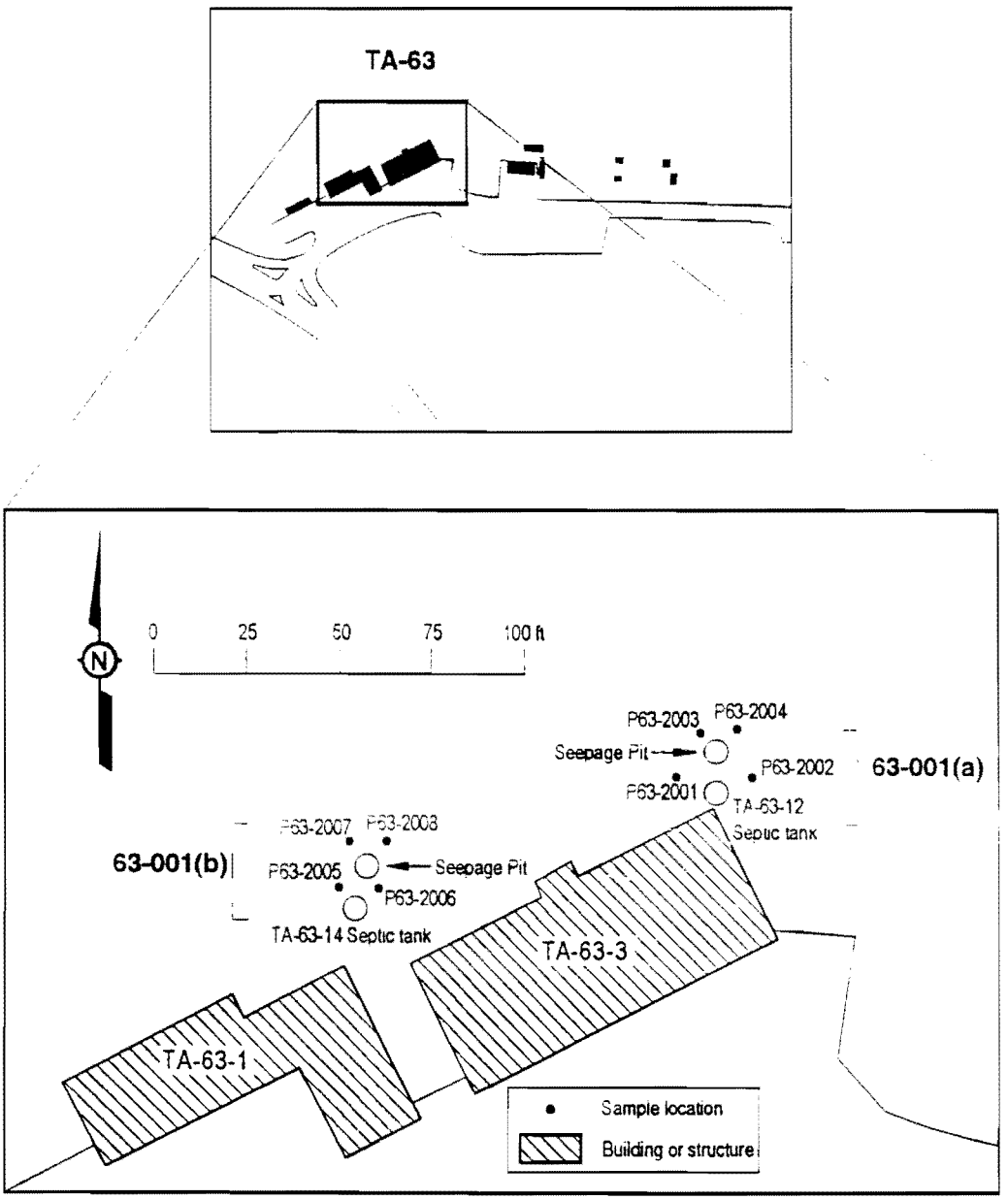


FIG 7-42 / 091393 LANL 1989 (ENG-R-7100, Rev. 13)

Figure 7-42. Schematic sample location map for SWMUs 63-001(a and b), Aggregate P

of the septic tanks and seepage pits. Decision logic for the Phase I field investigation activities to be performed at SWMU Aggregate P is presented in Figure 7-43 and discussed in the following text.

7.20.2 Phase I Field Investigation Activities

The technical approach for the Phase I investigation at SWMU Nos. 63-001(a and b) will consist of three tasks. These include the engineering and environmental surveys discussed in Section 7.4, and subsurface sampling in the vicinity of the septic tanks and seepage pits (Figure 7-42).

The engineering survey will locate the septic tanks and seepage pits and the perimeters of the septic tanks and seepage pits will be marked with stakes. A rectangular grid approximately 20 ft by 35 ft enclosing each system will be located for the radiation survey. Stationary radiological counts for a duration of one minute will be collected at the center of each septic tank and drain pit using a FIDLER. The grid will also be used to locate a survey for the presence of VOCs using a PID.

Each septic system in SWMU Nos. 63-001(a and b) consists of an active septic tank, associated drains, and a seepage pit. Both seepage pits are constructed to a depth of 50 ft and are 4 ft in diameter. The Phase I investigation will perform subsurface sampling to determine if hazardous constituents have been released from the septic systems. Surface contamination is not expected because all portions of the systems are subsurface, which the environmental survey will, in part, confirm.

The subsurface investigation of SWMU Nos. 63-001(a and b) will consist of eight soil borings. These borings will be made using a decontaminated, continuous, 5-ft core barrel (Figure 7-42). One soil boring will be placed approximately 5 ft west and another 5 ft east of each septic tank for a total of four borings. These boreholes (**P63-2001, P63-2002, P63-2005, and P63-2006**) are indicated in Figure 7-42 to structure the analytical suite for remaining sample locations. Table 7-8 indicates all anticipated analyses. The purpose of these boreholes is to determine if hazardous constituents may have leaked from the septic tanks. These 4 borings will be drilled to a minimum depth of 20 ft. Coring will begin at the ground surface and continue through the entire depth of the boring. As the 5-ft sections of core are retrieved from the borehole using a wireline, they will be screened for radionuclides using a scintillation detector and for VOCs using a PID. Sample screening will begin with the second 5-ft interval retrieved because contamination is not expected above the base of each tank. Samples will be collected from the 5-ft core interval in which the highest radiation reading and highest VOC reading are found. If the screening for radionuclides is negative or below background, samples will not be submitted for radionuclide analyses. If the screening for VOCs is negative, then the sample will be collected from the midpoint of the 5-ft continuous-core interval.

To investigate the potential release of contaminants from the seepage pits, one soil boring will be placed approximately 5 ft west and 5 ft east of each seepage pit for a total of four borings. Because the pits are 50 ft deep, the borings will be drilled to a depth of 60 ft. Coring will begin at the ground surface and continue to a depth of 60 ft. For each 5-ft interval of core, radiation and VOC screening will be implemented using the methods discussed previously. Along each 5-ft core interval between the surface and 60 ft, in which radionuclide or VOC readings are found to be above background, samples will be collected. When above background radioactivity is

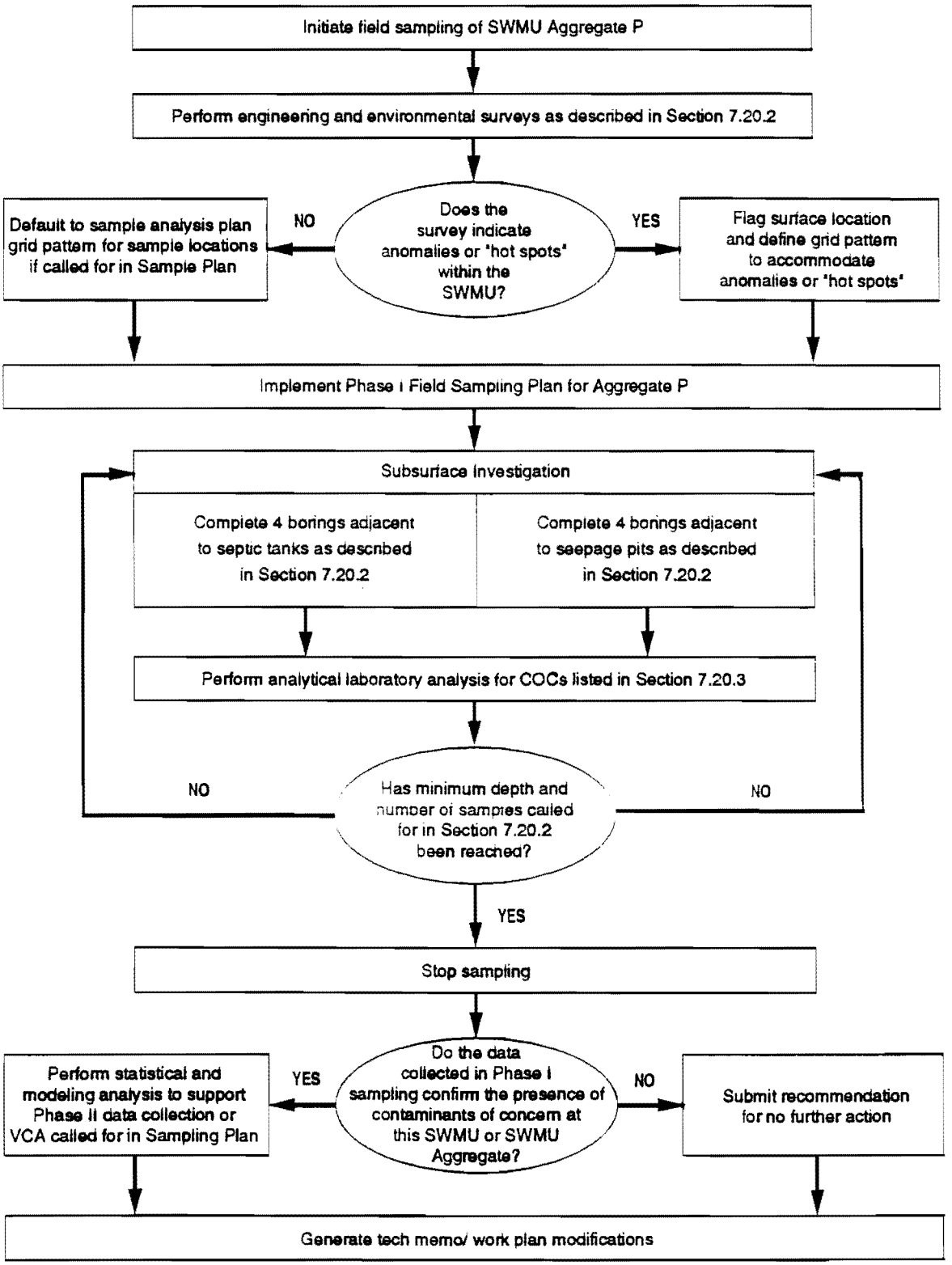


Figure 7-43. Decision logic for the sampling and analysis of SWMU Aggregate P.

found in the interval, a sample will be collected along the 5-ft interval in which the radionuclide reading is the greatest. A sample will be collected along the 5-ft interval in which the VOC readings are highest. For intervals between 45- and 60- ft, samples will be taken from the midpoint of the core interval.

The minimum drill hole depth is 60 ft. If radiation and VOC readings have not exceeded background levels for two consecutive 5-ft intervals at that depth, then drilling will cease. If above-background readings are detected at the 60-ft depth, then drilling will continue until radiological and VOC measurements are below background for two consecutive intervals, or until the drilling rig is not capable of going deeper.

Samples will be analyzed for metals, VOCs, SVOCs, and the miscellaneous analytes nitrate, nitrite, and total organic carbon (TOC) (Table 7-19).

7.20.3 Sample Screening and Analysis

Each sample will be screened with a scintillation detector for radiation. All sample packages must be screened for surface contamination and contact radiation. Samples will be analyzed for gross-alpha, -beta, and -gamma; gamma spectrometry; alpha spectroscopy; VOCs; SVOCs; metals; nitrate; nitrite; and TOC.

Table 7-19 outlines the total number of matrix and QA/QC sample required for this field investigation, the corresponding analyses, and sample requirements. Appendix B should be consulted for procedure regarding the use of specified field sampling equipment; sample handling, packaging and shipping; equipment decontamination; and field instruments.

TABLE 7-19

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE P

			Analyses Required [a]										
	SAMPLE NUMBER	DEPTH	Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil	Nitrate	Nitrite	Total Organic Carbon
63-001 (a)	P63-2001-B1	5-10 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2001-B2	10-15 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2001-B3	15-20 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2002-B1	5-10 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2002-B2	10-15 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2002-B3	15-20 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2003-B1	0-5 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2003-B2	5-10 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2003-B3	10-15 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2003-B4	15-20 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2003-B5	20-25 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2003-B6	25-30 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2003-B7	30-35 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2003-B8	35-40 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2003-B9	40-45 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2003-B10	45-50 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2004-B1	0-5 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2004-B2	5-10 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2004-B3	10-15 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2004-B4	15-20 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2004-B5	20-25 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2004-B6	25-30 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2004-B7	30-35 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2004-B8	35-40 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2004-B9	40-45 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2004-B10	45-50 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2004-B11	50-55 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2004-B12	55-60 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2005-B1	5-10 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2005-B2	10-15 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2005-B3	15-20 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2006-B1	5-10 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2006-B2	10-15 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2006-B3	15-20 ft	1	1	1	1	1	1	0	0	1	1	1

TABLE 7-19 (continued)

PHASE I SAMPLING SUMMARY FOR OU 1129 SWMU AGGREGATE P

			Analyses Required*										
	SAMPLE NUMBER	DEPTH	Gross-alpha,-beta,-gamma	Gamma Spectrometry	Alpha Spectroscopy	Metals by XRF or ICPES	VOCs	SVOCs	PCBs	Tritium in Soil	Nitrate	Nitrite	Total Organic Carbon
63-001 (a)	P63-2007-B1	0-5 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2007-B2	5-10 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2007-B3	10-15 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2007-B4	15-20 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2007-B5	20-25 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2007-B6	25-30 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2007-B7	30-35 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2007-B8	35-40 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2007-B9	40-45 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2007-B10	45-50 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2007-B11	50-55 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2007-B12	55-60 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2008-B1	0-5 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2008-B2	5-10 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2008-B3	10-15 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2008-B4	15-20 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2008-B5	20-25 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2008-B6	25-30 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2008-B7	30-35 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2008-B8	35-40 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2008-B9	40-45 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2008-B10	45-50 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2008-B11	50-55 ft	1	1	1	1	1	1	0	0	1	1	1
	P63-2008-B12	55-60 ft	1	1	1	1	1	1	0	0	1	1	1
Rinsate Blanks			3	3	3	3	3	3	0	0	0	0	0
Bottle Blanks			3	3	3	3	3	3	0	0	3	3	3
Trip Blanks			3	3	3	3	3	3	0	0	3	3	3
Duplicates			3	3	3	3	3	3	0	0	3	3	3
TOTALS			70	70	70	70	70	70	0	0	67	67	67

*Section 5.0 ofthe Generic Quality Assurance (QA) Project Plan for RCRA Facility Investigations for the LANL ER Program (LANL 1991, 0843), includes U.S. EPASolid Waste (SW) 846 quantitative and detection limits for the various required analytes.

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