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THIS FORM IS SUBJECT TO CHANGE. CONTACT THE RPF FOR LATEST VERSION. (JUNE 1997)

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memorandum

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Date: March 20, 1994

SUBJECT: Formal Review of RFI Work Plan for OU 1114, Addendum 1 LA-UR-95-731

Attached for your formal review (classification review for FSS-16) is a draft copy of the RFI Work Plan for OU 1114, Addendum 1. The document consists of Chapter 4, Technical Approach; Chapter 5, Evaluation of PRS Aggregates; Chapter 6, PRSs Proposed for No Further Action or Deferred Action; Appendix D, Field Investigation Approach and Method; and Annex II, Quality Assurance Project Plan. Chapters 4, 5, 6, and Annex II are submitted as addenda to the respective chapters of the July 1993 RFI Work Plan for OU 1114. The Appendix D contained in this draft of Addendum 1 is intended to replace the Appendix D found in the July 1993 RFI Work Plan for OU 1114.

Please forward your comments to Garry Allen or Lynda Sobojinski by Wednesday, April 26. A comment resolution sheet is attached, as well as an electronic copy on disk, Macintosh format.

Thank you for your time and attention. We look forward to receiving your comments.

Should you have any questions, please feel free to contact Garry Allen at (505)667-3394 or Lynda Sobojinski at (505)665-8339.

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Received by EM-RPF
NOV 25 1998
MVA

1. Need to note that Subsection 5.11 was in a NOD response + that Addendum 1 begins with 5.12.
2. Send REF INFO with references that are incomplete to Julie Wilson, ERM.
3. Develop Appendix C -

Correction Copy

RFI Work Plan Addendum 1 for Operable Unit 1114

Environmental Restoration Project

March 20, 1995

A Department of Energy
Environmental Cleanup Project

DRAFT

Los Alamos
National Laboratory

7-13-95

Executive Summary

Chapter 1
Introduction

Chapter 2
Background Information

Chapter 3
Environmental Setting

Chapter 4
Technical Approach

Chapter 5
Evaluation of PRS Aggregates

Chapter 6
PRSs Recommended for No Further Action or Deferred Action

Annexes

Appendixes

Chapter 4

RFI Work Plan (1993)

- Aggregation of Potential Release Sites (PRSs)
- Approaches to Site Characterization
- Conceptual Exposure Models
- Potential Response Actions and Evaluation Criteria
- Sampling Strategies
- Analytical Methods

Addendum 1

- Aggregation of Potential Release Sites
- Site Characterization Decision Model
- Site-Wide Investigation Approach
- Conceptual Site Model for OU 1114

1wd

4.0 TECHNICAL APPROACH

4.1 Aggregation of Potential Release Sites

The potential release sites (PRSs) to be evaluated in this Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) work plan were aggregated for Operable Unit (OU) 1114 by proximity, physical similarity, and similarity of historical use. Chapter 5 in the RFI Work Plan for OU 1114 covered 10 aggregates composed of 53 PRSs (LANL 1993, 1090). Chapter 5 in Addendum 1 to the RFI Work Plan for OU 1114 covers 16 aggregates composed of ~~25~~ 24 PRSs. Table 4-1 lists aggregates in Chapter 5 of Addendum 1, the PRS numbers, and generic strategies used for aggregation. The first digit(s) of the solid waste management unit (SWMU) or area of concern (AOC) number identifies the technical area in which it is located. Table 4-2 lists PRSs discussed in Chapter 6 of Addendum 1 that are candidates for no further action (NFA) or deferred action (DA), including criteria used for these decisions. An NFA decision that is based on absence of human health risk does not imply that ecological risks do not exist. The ecological risk assessment process is described in Subsection 4.5.

4.2 Site Characterization Decision Model

This work plan adheres to the Laboratory's Environmental Restoration (ER) Project technical approach for data collection and evaluation as documented in Chapter 3 of the Installation Work Plan (IWP) (LANL 1995, 1164). This technical approach is an efficient, defensible, and effective method of data collection for support of environmental decision-making. The Laboratory's approach is an adaptation of the Department of Energy's (DOE's) streamlined approach for environmental restoration (SAFER) which combines elements of the data quality objectives (DQO) process (Chapter 3 of the IWP) and the observational approach (Appendix G of the IWP) (LANL 1995, 1164; LANL 1993, 1017). At Los Alamos National Laboratory (LANL), these tools are applied within the framework of a project-wide decision flow (Fig. 4-1) which uses human health and environmental risk as the basis for site-specific decision-making.

TABLE 4-1

AGGREGATES IN CHAPTER 5, ADDENDUM 1

SWMU OR AOC NUMBER	AGGREGATE DESCRIPTION	SUBSECTION	BASIS OF AGGREGATION	NUMBER OF PRSs IN AGGREGATE
3-054(e), C-3-006	Outfall	5.12	C-3-006 is source to 3-054(e)	2
3-049(a)	Outfall	5.13	NA	1
3-021	Outfall	5.14	NA	1
3-052(b), 3-056(k)	Storm drains and storage area	5.15	3-056(k) is source to 3-052(b)	2
3-054(b), 3-052(a,e)	Outfall	5.16	3-052(a,e) are sources to 3-054(b)	3
3-001(e)	Storage area	5.17	NA	1
3-049(b), C-3-014	Outlet discharge area and equipment storage area	5.18	Proximity	2
3-059, 3-003(n)	Salvage yard	5.19	Proximity	2
3-001(i)	Two former storage areas	5.20	Related to the Asphalt Batch Plant	1
3-034(a)	Radioactive liquid waste tanks	5.21	NA	1
3-007	Decommissioned firing site	5.22	NA	1
3-004(c,d)	Dumpster areas	5.23	Similarity	2
3-053	Duplicate of SWMU 3-015	5.24	NA	1
3-052(f)	Duplicate of SWMUs 3-013(a,b)	5.25	NA	1
3-042	Duplicate of SWMU 3-003(a)	5.26	NA	1
3-045(b,c)	Duplicates of SWMU 3-012(b)	5.27	Proximity	2

TABLE 4-2

PRSs PROPOSED FOR NO FURTHER ACTION
OR DEFERRED ACTION[a] IN CHAPTER 6, ADDENDUM 1

TABLE 4-2 (CONTINUED)

PRSs PROPOSED FOR NO FURTHER ACTION OR DEFERRED ACTION[a] IN CHAPTER 6, ADDENDUM 1

TABLE 4-2 (CONTINUED)

PRSs PROPOSED FOR NO FURTHER ACTION
OR DEFERRED ACTION[a] IN CHAPTER 6, ADDENDUM 1

TABLE 4-2 (CONTINUED)

PRSs PROPOSED FOR NO FURTHER ACTION OR DEFERRED ACTION[a] IN CHAPTER 6, ADDENDUM 1

TABLE 4-2 (CONTINUED)

PRSs PROPOSED FOR NO FURTHER ACTION
OR DEFERRED ACTION[a] IN CHAPTER 6, ADDENDUM 1

TABLE 4-2 (CONTINUED)

PRSs PROPOSED FOR NO FURTHER ACTION OR DEFERRED ACTION[a] IN CHAPTER 6, ADDENDUM 1

TABLE 4-2 (CONTINUED)

PRSs PROPOSED FOR NO FURTHER ACTION
OR DEFERRED ACTION[a] IN CHAPTER 6, ADDENDUM 1

TABLE 4-2 (CONTINUED)

PRSs PROPOSED FOR NO FURTHER ACTION OR DEFERRED ACTION[a] IN CHAPTER 6, ADDENDUM 1

TABLE 4-2 (CONTINUED)

PRSs PROPOSED FOR NO FURTHER ACTION
OR DEFERRED ACTION[a] IN CHAPTER 6, ADDENDUM 1

[a]Environmental Restoration Project 1995, 1173.

In this approach, investigations are phased to address decisions in a sequential manner, where each decision brings the efforts at OU 1114 closer to the ultimate goal of selecting and implementing an appropriate corrective action. The LANL ER Project decision sequence (Fig. 4-1) is applied, along with a series of corresponding technical assumptions, to each decision. The decision flow translates each phase of the RCRA corrective action process into an operational sequence of questions (i.e., it addresses each phase of the corrective action process by identifying one or more decisions that can be made based on the collection and evaluation of defensible data sets). The decision flow and technical assumptions were formally discussed and approved by a task force consisting of senior representatives from DOE, the Environmental Protection Agency (EPA), Region 6, New Mexico Environment Department (NMED), LANL, and Sandia National Laboratory.

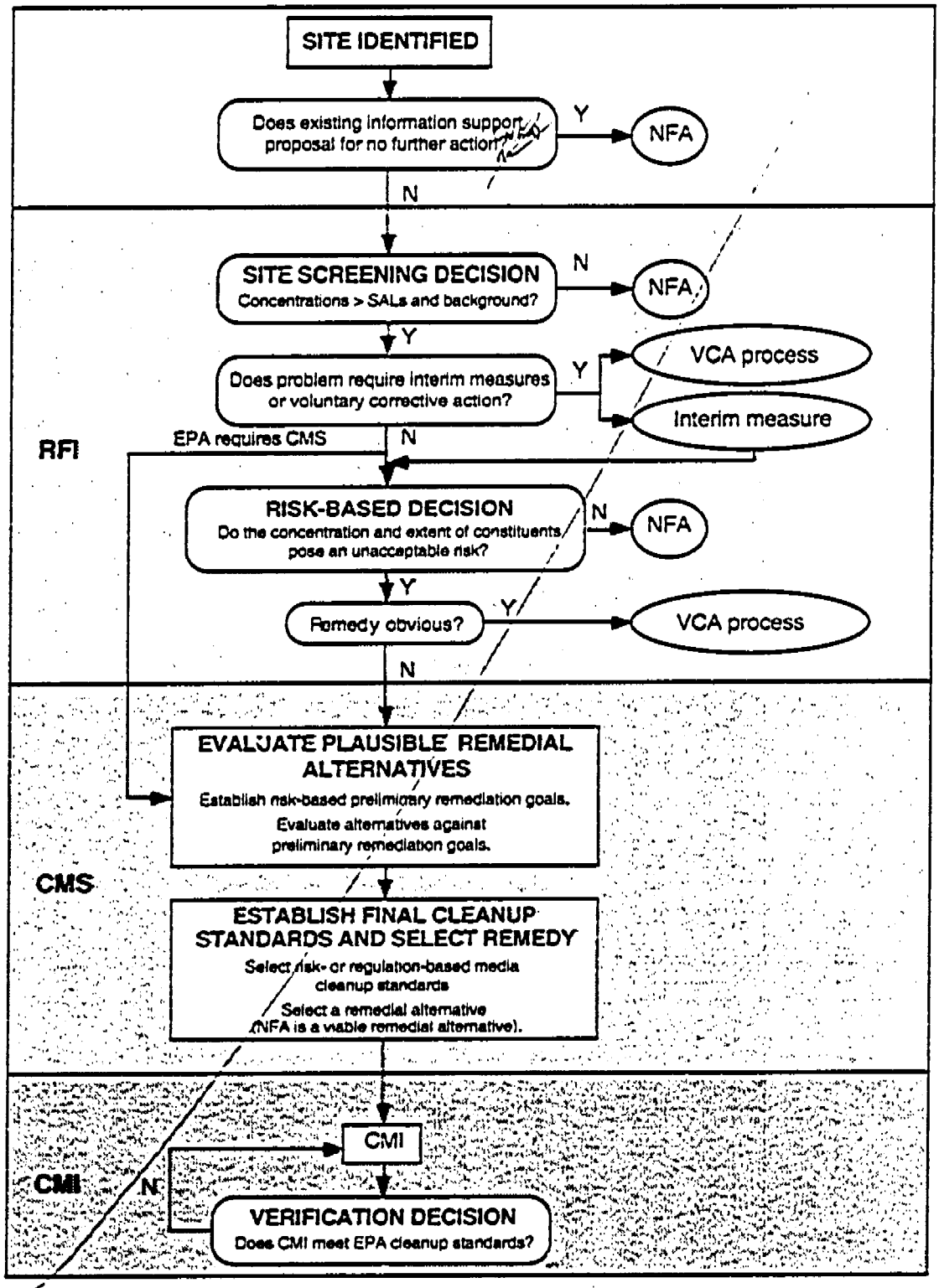

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Fig. 4-1. Framework for project-wide decision flow.

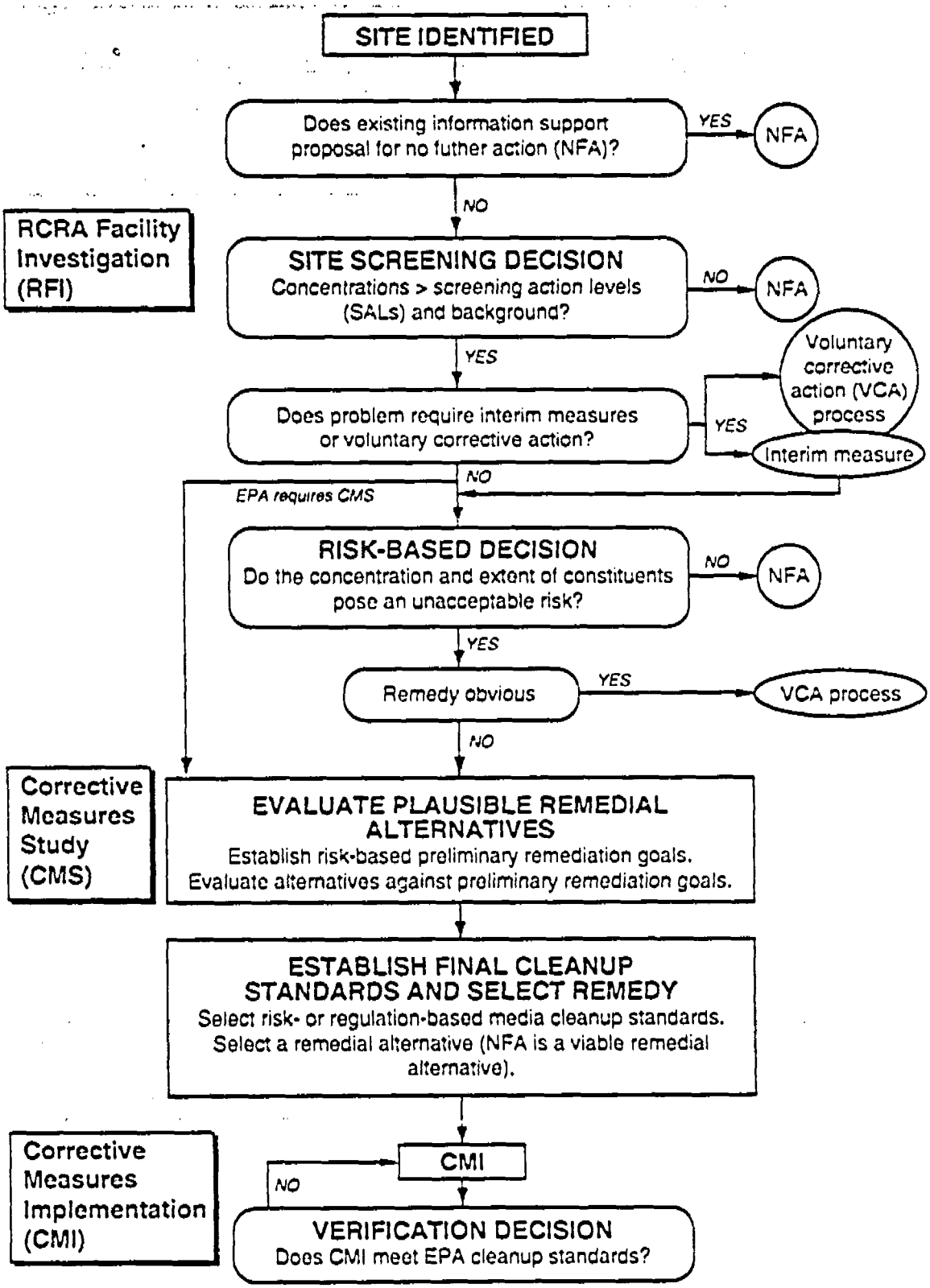

Fig. 4-1. Framework for project-wide decision flow.

4.3 Sitewide Investigation Approach

DQOs are requirements that specify the quality of data collected during the RFI. The formal DQO planning approach developed by EPA consists of seven steps: 1) state the problem, 2) identify the decision, 3) identify inputs to the decision, 4) define the study boundaries, 5) develop a decision rule, 6) specify limits on decision uncertainty, and 7) optimize the design for collecting data. The sampling and analysis plans for most PRSs are based on the screening assessment decision in which DQO input is prespecified; therefore, a formal DQO process is not followed for these PRSs. The prespecified, generic DQO inputs for screening assessment decisions is presented below, along with a description of the approach used to specify DQOs for all PRSs in Chapter 5, Addendum 1.

4.3.1 State the Problem

The purpose of the first step of the DQO process is to summarize what is known about the potential contamination problem at each PRS. Archival information is compiled and evaluated and field reconnaissance visits are made to formulate a conceptual mode. This information is summarized in the description and history subsection for each aggregate in Chapter 5, Addendum 1. These historical data help develop a list of chemicals of potential concern (COPCs), summarized in Table 4-3, and a conceptual exposure model for each aggregate, which is discussed in Subsection 4.4 of this chapter.

4.3.2 Identify the Decision

After the description and history have been documented, the next step in the DQO process is to identify the decision to be made. The planning team determines where each PRS falls in the RCRA decision sequence (Fig. 4-1). As noted above, PRSs are sampled to evaluate the site screening or screening assessment decision (Fig. 4-2). The objective of the generic screening assessment decision statement is to determine if a release has ocurred ~~at the PRS~~ in which the environmental concentration exceeds conservative screening action levels.

For certain PRSs, historical information is adequate to identify potential contaminants and estimate the volume of contaminated media. For these PRSs, it is more efficient to collect sufficient data to conduct a voluntary corrective action (VCA) an expidited cleanup (EC), or to conduct the RFI Phase I and Phase II investigations within a single field mobilization. Such exceptions to the generic screening assessment decision statement will be documented in the investigation approach and objectives subsection for each aggregate in Chapter 5, Addendum 1.

TABLE 4-3

BACKGROUND AND SCREENING ACTION LEVELS FOR REGULATED SUBSTANCES AT OU 1114

CHEMICALS OF CONCERN	CRQL[a] (mg/kg)	UPPER TOLERANCE LIMITS FOR LANL SOIL BACKGROUND (mg/kg)	SCREENING ACTION LEVEL IN SOIL (mg/kg)
Metals			
Antimony	12[b]	NA[c]	32
Arsenic	2	11.6	[c]
Barium	40	1 140	5 600
Beryllium	1[b]	3.31	[d]
Cadmium	1	NA	80
Chromium III	2	NA	80 000
Chromium VI	2	NA	400
Cyanide	2	0	1 600
Lead	0.6	39	400[e]
Mercury	0.04	NA	24
Nickel	8	26.7	1 600
Silver	2	NA	400
Uranium (natural)	NA	NA	66
Volatile organic compounds			
Acetone	0.01	0	8 000
Benzene	0.01[b]	0	0.67
Ethylbenzene	0.01	0	3 100
Toluene	0.01	0	910
Trichloroethene	0.01	0	3.2
1,1,1-Trichloroethane	0.01	0	1 000
1,1,2-Trichloroethane	0.01	0	6.3
Xylene	0.01	0	160 00
Semivolatile organic compounds			
Benzo(a)pyrene	0.33[b]	0	0.10
Herbicides	NA	NA	NA
PCBs	NA	0	0.09
Pesticides	NA	NA	NA
Phenol	0.33	0	48 000
Radionuclides (pCi/g)	**CRQL (pCi/g)**	**REGIONAL BACKGROUND (pCi/g)**	**SCREENING ACTION LEVEL (pCi/g)**
Cesium-137	Not required	0.43/64[f]	4[g]
Plutonium-238	Not required	0.001/76[f]	20[g]
Plutonium-239	Not required	0.007/76[f]	18[g]
Tritium	Not required	0.98/43[f,h]	810[g]
Uranium-235	Not required	NA	18[g]

[a] Contract-required quantitation limits (CRQLs) for soil [Appendix J of IWP (LANL 1993, 1017)].
[b] The screening action level (SAL) is less than the CRQL; therefore, special analytical services may be required.
[c] NA = Not available.
[d] Background comparison should be performed for this compound to determine if further action is required.
[e] Soil SAL based on EPA OSWER Directive 9355.4-12, "Revised Interim Guidance on Establishing Lead Cleanup Levels at Superfund Site," (EPA 1994, 1209).
[f] Purtymun et al. 1987, 0211.
[g] Determined by Laboratory risk assessment committee.
[h] Assuming 10% soil moisture.

4.3.3 Identify Decision Input

After specifying the decision to be made, the third step of the DQO process involves identifying the input to the decision. The objective is to identify all informational input required to resolve the decision [including, when possible, the screening action level(s)] and to list all the environmental variables or characteristics that need to be measured to provide information required to make the decision. The generic screening assessment decision input states that the decision input includes the screening action levels or background levels for each potential contaminant. In cases where screening action levels are not available, they will be calculated.

In some cases the PRS archival data are adequate to focus the investigation on particular contaminants. For example, at capacitor storage sites a defensible approach may be to focus the study on polychlorinated biphenyls (PCBs) alone. If the historical data are uncertain, a complete analyte suite may be needed to determine the list of constituents of concern (COCs). If fewer analytes than the standard list of RCRA analytes are being analyzed at a PRS, then the information supporting a reduced analyte suite will be included in the investigation approach and objectives subsection for each aggregate in Chapter 5, Addendum 1.

4.3.4 Define the Study Boundaries

The generic screening assessment decision boundary states that the spatial domain is the boundaries of the PRS as defined in the Facility for Information Management, Analysis, and Display (FIMAD) database. Samples submitted for laboratory analysis will be collected from the portion of the soil (or bedrock) horizon that is most likely to contain COPCs. For example, samples collected for volatile organic compounds (VOCs) will be from deep-surface corings (greater than six inches depth). Temporal variation is not an issue for sampling any PRS. This generic statement applies to all PRSs in Chapter 5, Addendum 1. The rationale for PRS-specific soil sampling depths is presented in Subsection 5.0 and the investigation approach and objectives subsection for each aggregate in Chapter 5, Addendum 1.

4.3.5 Decision Logic

The main goal of the screening assessment is to determine if there are any COCs in site media (Fig. 4-2). The generic screening assessment decision rule statement declares: if the maximum concentration of all hazardous constituent concentrations is below the screening action level (SAL) or background concentration, then propose NFA for this PRS. Comparison to LANL background will be made according to guidance provided in ER Project Policy Paper, Statistical Comparisons to Background, Part 1 (ER Project Assessments Council 1995, 1218). Before proposing NFA for a site, the data will be reviewed for multiple constituents that are marginally

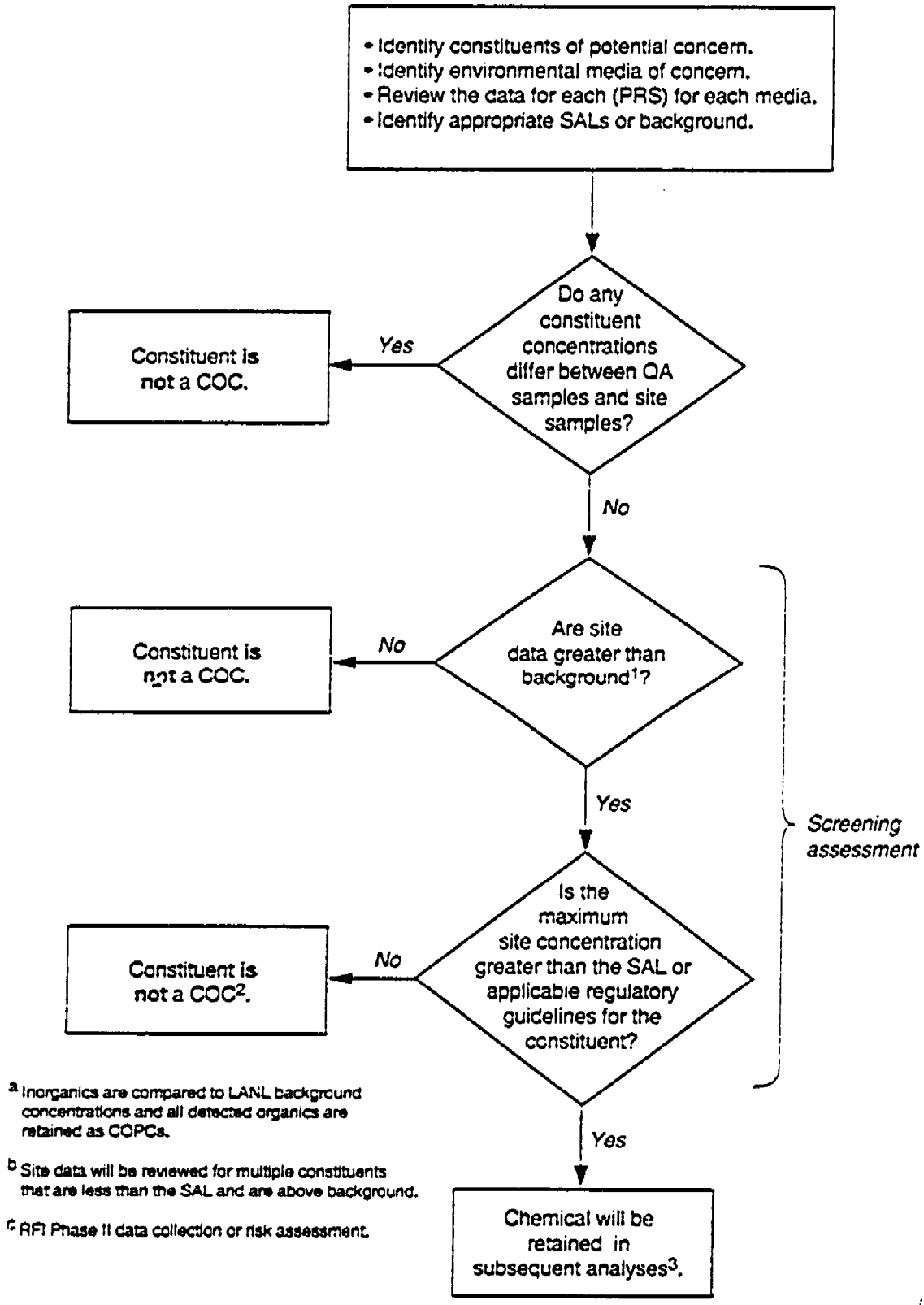

Fig. 4-2. Screening assessment flow chart.

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less than the SAL. If any hazardous constituent concentration is greater than the SAL or background concentration, then either conduct a Phase II RFI investigation, a VCA, or proceed to a corrective measures study (CMS) for this PRS.

A Phase II investigation, VCA, or CMS will be selected based on the ability to conduct a baseline risk assessment with Phase I data and availability of an obvious remedy for the site. Decision rules for sites where screening assessment is not planned will be presented in the investigation approach and objectives subsection for each aggregate in Chapter 5, Addendum 1.

SALs are media-specific, risk-based concentration levels for potential contaminants derived using conservative criteria. The motivation for developing SALs is to adequately discriminate between problem and non-problem sites so that resources are used effectively. SALs for the primary COPCs at OU 1114 are provided in Table 4-3. In most cases, SALs for nonradiological constituents are based on the methodology in Proposed Subpart S of RCRA to calculate action levels (EPA 1990, 0432). Radiological SALs are based on a 10 mrem per year dose using a conservative residential-use exposure scenario. SALs for radionuclides can be derived using the residual radioactive material (RESRAD) model that has been developed for the DOE (Yu et al. 1993, 1014). However, if a regulatory standard exists and is lower than the value derived by these methods, this lower value will be used for the SAL. The derivation of SALs and their values is discussed in Appendix J of the IWP (LANL 1993, 1017).

It is important to note that PRS decisions beyond the screening assessment will not be made based on the maximum observed value. SALs are not cleanup levels. Cleanup levels will be based on site-specific risk evaluations and as low as reasonably achievable (ALARA) criteria. Risk assessment is typically based on the 95% upper confidence limit of the average concentration. LANL's approach adopts the Superfund risk assessment guidance for chemical constituents (EPA 1991, 0746) and DOE's RESRAD model for radionuclides (Yu et al. 1993, 1014). In both cases the average concentrations within appropriate exposure units (EUs) should be used as input to the decision.

If the site investigation results in a determination that remediation is necessary, the selected remediation alternatives must achieve acceptable risk levels. Choices between alternatives that meet the human health risk requirements will be based on additional factors such as ecological impact, cost, socioeconomic impact, public/community input, regulatory concerns (in addition to risk), and impact on Laboratory operations (Appendix I of the IWP) (LANL 1993, 1017). Note that all actions refer to potential or known contamination in surface or subsurface

soil. There is no indication that other contaminated media exist which might require other technologies (e.g., steam injection for vadose zone contaminants).

A PRS may be proposed for NFA if: 1) no COCs are known or found present at concentrations above SALs or background (whichever is appropriate) based on historical data or Phase I sampling; 2) COCs are judged not to have been released and unlikely to be released in the future; or, 3) some other regulatory program takes precedence. NFA designations are possible at any point in the remedial process. Appendix I, Subsection 4.1 of the IWP presents a detailed discussion of the rationale for NFA or DA based on archival information (LANL 1993, 1017).

Chapter 6, Section 6.0 briefly presents the basis for NFA and DA decisions for PRSs in Addendum 1. PRSs proposal for NFA or DA in Addendum 1 are listed in Table 4-2.

VCAs will be undertaken when necessary to protect the health and safety of the public and Laboratory personnel, when waste site conditions are such that a VCA is an appropriate response to stop further migration or dispersion of contaminants into the environment, or when cost-effective. In units of limited area where hazardous constituents are known or suspected, a VCA will be initiated (e.g., removal of soil), guided by field screening to the point where regulatory cleanup levels are accomplished. After the VCA is complete, confirmatory samples will be submitted for fixed-laboratory analyses.

4.3.6 Design Criteria: Limits on Decision Errors

The limits on decision uncertainty or survey design criteria are specific for each PRS aggregate. Most screening assessment decisions are based on judgmental design criteria because there are no quantitative historical data to use in a statistical survey design. Judgmental designs are based on biasing sample locations to visual or geomorphic indicators so that there is increased probability of hitting the maximum constituent concentration in a PRS. Key assumptions of the biasing scheme are tested by collecting field quality assessment samples. Field quality assessment samples include collocated samples and samples downgradient of the expected maximum constituent concentration.

For sites where a more sophisticated approach is taken beyond the screening assessment, quantitative decision performance requirements will be developed. The assumptions behind these statistically designed sampling and analysis plans include: the spatial heterogeneity of contamination at the site, the desired probability of detecting contamination, and the likely concentrations of COCs given the historical site information. The expected heterogeneity of the site will be summarized by a simple conceptual model of contaminant release and subsequent environmental transport. For example, historical photographs of a salvage yard show the

location of equipment storage and staining that will be preferentially sampled in the RFI investigation. This information also bounds the probability of detecting stains of this size. Site-specific information used to design the sampling and analysis plan will be presented in the investigation approach and objectives subsection for each aggregate in Chapter 5, Addendum 1.

No RFI investigation is currently designed to collect data that meet requirements of a baseline risk assessment. Developing a defensible sampling and analysis plan for risk assessment investigations requires specifying decision error tolerances. However, data obtained from an RFI investigation can be used to determine if contaminant concentration limits established by SALs have been exceeded, and if additional data collection is necessary for risk assessment.

4.3.7 Optimize Design: Develop a Sampling and Analysis Plan

The last step of the DQO process is to evaluate alternative sampling and analysis plans for data collection and to select the plan that is expected to meet the DQOs in the most cost-effective manner. For most sites in Chapter 5, Addendum 1, a judgmental sampling-analysis plan was developed to meet the screening assessment DQOs. The sampling and analysis plan is presented in the sample locations and methods and laboratory analyses subsections for each aggregate in Chapter 5, Addendum 1.

For a small subset of sites, some quantitative decision performance requirements were established and a statistically based sampling and analysis plan was developed. Statistical design optimization requires pertinent estimates of uncertainty, general understanding of the underlying distribution of the COCs, and a complete set of DQOs. Professional judgment is relied upon determining where to take samples. However, even a sampling and analysis plan that was a statistical model to help select the number of samples, choosing appropriate analytical methods for either a screening assessment or risk-based decision involves working with the chemists and statisticians to determine the most efficient way to generate data of acceptable quality as defined by the end user. Some issues considered include: the sensitivity of the analytical method compared to the SAL or other decision point, the performance of the method on LANL matrix samples, turnaround times, and ability to measure multiple constituents of potential interest at once. In most cases, the magnitude of analytical error is expected to be small compared to sampling error. However, when evaluating statistical designs, measurement error is simultaneously evaluated to ensure that the expected performance of the method will achieve the stated DQOs.

Assuming that the screening assessment yields values higher than SALs and background for constituents of interest, these data are often valuable in evaluating alternative designs for further data collection in support of risk-based decisions. A variety of statistical survey methods appropriate for estimating means are discussed in the IWP and will be considered in future phases of data collection (LANL 1993, 1017). In addition, future phases of the RFI investigation will consider the impact of multiple source terms on contaminant migration and distribution.

4.4 Conceptual Site Model for OU 1114

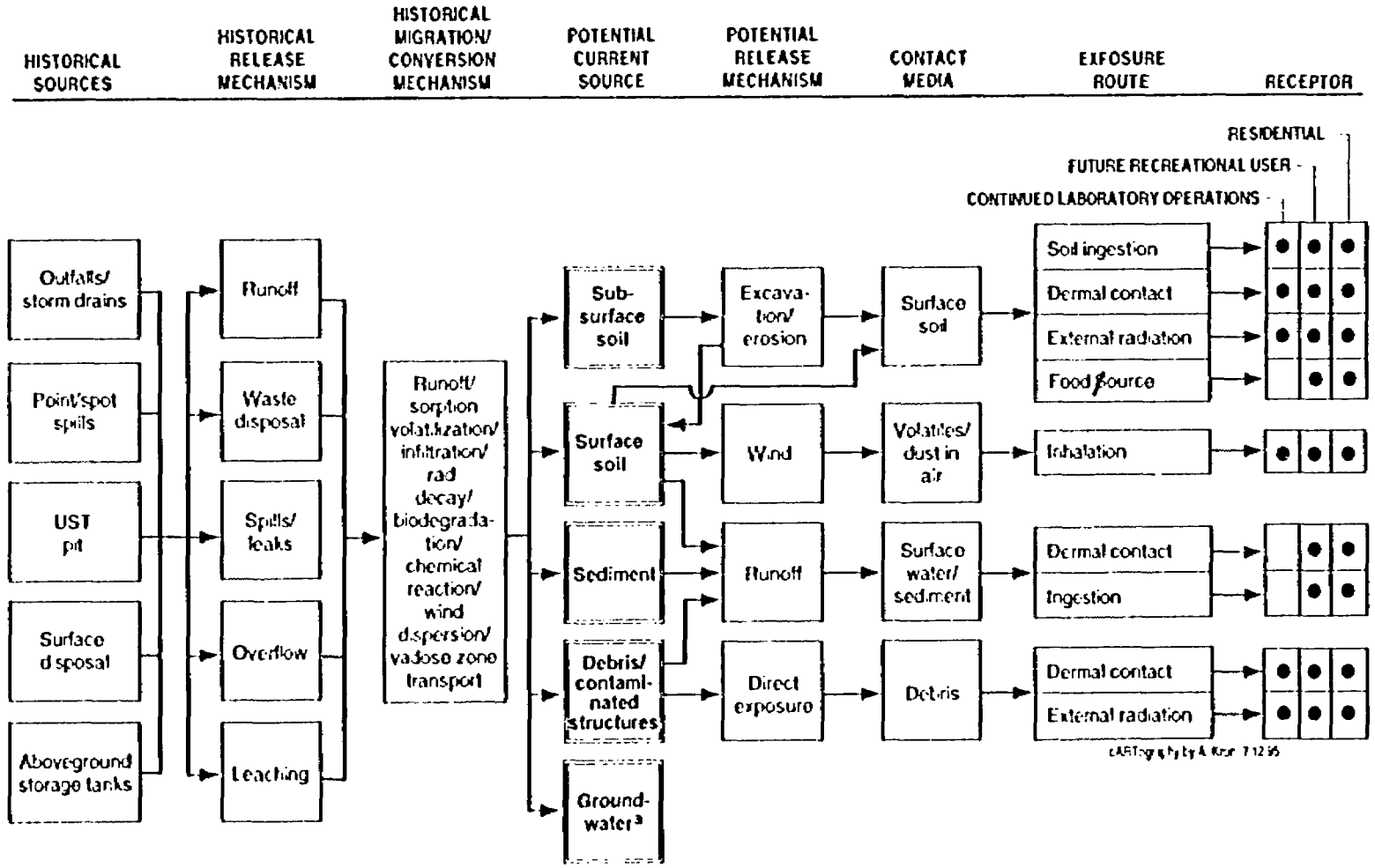
A conceptual site model was developed for each PRS aggregate to help identify the location and magnitude of sampling needed to accurately characterize the PRSs at OU 1114. The conceptual site model shown in Fig. 4-3 identifies historical sources of environmental release, migration, potential current sources of contaminants, potential release mechanisms, contact media, and exposure routes and receptors for OU 1114. Formulation of the conceptual site model for OU 1114 is based on available PRS information. Further refinement or development of separate models may be necessary based on data gathered through the RFI.

Chemicals or radionuclides at OU 1114 may have been released into the environment via drainages, outfalls, landfill areas, spills, leaks, or spattering to surface soil from storage areas, storage tanks, or surface impoundments. After contaminants have been released into the environment, they can potentially migrate via: 1) liquid infiltration into near-surface or subsurface soils that may reach groundwater via faults or surface water via seeps, 2) volatilization into ambient air, 3) wind entrainment of contaminated dust and deposition onto surface soils, and 4) surface water overflow and then runoff resulting in the contamination of sediments in drainage channels. These pathways are further described in Table 4-4.

The major environmental media that may be contacted by receptors, and the resulting potential human exposure pathways are described below.

4.4.1 Potential Human Exposure

The environmental media through which human exposure could occur include soil, air, surface water/sediment, and debris. Although contaminants could migrate to perched groundwater via faults or fractures, it does not present a potential exposure pathway because the main aquifer, at more than 800 ft deep, is the only aquifer used for domestic water supply. It is highly unlikely that contaminants could migrate to this depth. Section 3.0 of Chapter 3 contains a discussion of the hydrology of the main aquifer beneath OU 1114 (LANL 1993, 1090). Currently, there are no groundwater wells on site.



[a] No apparent releases occur from perched groundwater to an exposure pathway.

Fig. 4-3. Conceptual site model for OU 1114, Addendum 1

TABLE 4-4

SUMMARY OF RELEASE PATHWAYS

PATHWAYS/MECHANISM	CONCEPT/HYPOTHESES
HISTORICAL SOURCES	• Operations/processes that contributed to the creation of the PRS (i.e., storage area, etc.)
PRS RELEASE MECHANISM	• Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, leaching, dumping, or disposing into the environment
MIGRATION PATHWAY/ CONVERSION MECHANISM	
Atmospheric dispersion	• Entrainment is limited to chemicals in surface soils
Particulate dispersion	• Entrainment and deposition are controlled by soil properties, surface roughness, vegetative cover and terrain, as well as atmospheric conditions
Volatilization	• Volatilization occurs to volatile organic compounds in surface soils, subsurface soils, and surface water
Surface water runoff	• Surface runoff is directed by natural topographic features or man-made diversions and flows toward the canyons. A topographic low can cause the water to pond on the mesa top, but in most cases the water will flow into the canyon
	• Chemical transport by surface runoff can occur in solution, sorbed to suspended sediments, or as mass movement of heavier bed sediments
	• Surface runoff may carry chemicals beyond the OU boundary
	• Contaminated surface runoff may infiltrate the canyon-bottom alluvium
Sediments	• Surface soil erosion and sediment transport is a function of runoff intensity and soil properties
	• Chemicals dispersed on the soil surface can be collected by surface water runoff and concentrated in sedimentation areas in drainages
	• Erosion of drainage channels can extend the area of contaminant dispersal in the drainage
Alluvial aquifers	• Surface runoff discharged to the canyons may infiltrate into sediments of channel alluvium
Infiltration	• Infiltration into surface soils depends on the rate of precipitation or snowmelt, antecedent soil water status, depth of soil, and soil hydraulic properties
	• Infiltration into the tuff depends on the unsaturated flow properties of the tuff
POTENTIAL RELEASE MECHANISM	
	• Joints and fractures in the tuff may provide additional pathways for infiltration to enter the subsurface regime
Leaching	• Storm water/snowmelt can dissolve chemicals from soil or other solid media, making them available for contact
	• Water solubility of chemicals and their relative affinity for soil or other solid media affects the ability of leaching to cause a release

TABLE 4-4 (CONTINUED)

SUMMARY OF RELEASE PATHWAYS

PATHWAYS/MECHANISM	CONCEPT/HYPOTHESES
	• Leaching and subsequent resorption can extend the area of contamination
Soil erosion	• The erosion of surface soils is dependent on soil properties, vegetative cover, slope and aspect, exposure to the force of the wind, and precipitation intensity and frequency
	• Depositional areas as well as erosional areas exist, and erosive loss of soil may not occur in all locations
	• Storm water runoff can mobilize soils/sediments, making them available for contact
	• Storm intensity/frequency, physical properties of soils, topography, and ground cover determine the effectiveness of erosion as a release mechanism
	• Erosion may also enlarge the contaminated area
Mass wasting	• The loss of rock from the canyon walls is a discontinuous, observable process
	• The rate of the process is extremely slow
Resuspension (wind suspension)	• Wind suspension of contaminated soil/sediment as dust makes chemicals available for contact via inhalation/ingestion
	• Physical properties of soil (e.g., silt content, moisture content), wind speed, and size of exposed ground surface determine effectiveness of wind suspension as a release mechanism
	• Wind suspension can enlarge the area of contamination and create additional exposure pathways, such as deposition on plants followed by plant consumption by humans/animals
Excavation	• Manual or mechanical movement of contaminated soil during construction, remediation, or other activities makes contaminated soil available for dermal contact, ingestion, and inhalation as dust
	• The method of excavation (i.e., type of equipment), physical properties of soil, weather conditions, and magnitude of excavation activity (i.e., depth and total area of excavation) influence the effectiveness of excavation as a release mechanism
	• Excavation can increase or decrease the size of the contaminated area, depending on how the excavated material is handled

If environmental media are found to be contaminated and SALs are exceeded, the human exposure to these contaminants will be quantified in a baseline risk assessment. Human exposure may be estimated for both current and future land use assumptions. Currently, the land within the boundaries of OU 1114 is used for Laboratory operations, two privately owned cement mixing plants (on land leased from DOE), and the privately owned Royal Crest Trailer Court (on privately owned land) located approximately 0.25 mile east of the nearest PRS

(61-004) within OU 1114. Future land use could encompass recreational users and continued Laboratory operations; future residential use is possible but not as likely. Therefore, the following general land-use categories for OU 1114 have been identified: 1) continued Laboratory operations; 2) recreational land use; and 3) residential land use. Assumptions made for the three land-use scenarios are described below.

4.4.1.1 Continued Laboratory Operations Scenario

In the foreseeable future, land use is likely to be similar to current Laboratory operations. Populations of on-site workers (individuals who work on or near the site) and construction workers (individuals who would be exposed to near-surface and subsurface soils through various activities including excavation) are likely to be the reasonable maximum-exposed individuals for the continued Laboratory operations exposure scenarios.

On-site workers (e.g., maintenance workers, office workers) could be routinely exposed to contaminated media; therefore, this scenario is considered a reasonable-maximum exposure scenario for those PRSs in OU 1114 that consist of potential surface contamination (0 to 6 in.) on the mesa top. Surface contamination above SALs will be evaluated for both current and future risks in a baseline risk assessment using the on-site worker scenario. The types of PRS aggregates with potential surface contamination on the mesa top include: suface disposal, point/spot spill(s), outfalls, and storm drains.

The construction worker could be exposed to subsurface contamination during excavation activities. Once subsurface soil is excavated and brought to the surface, on-site workers could also be exposed. Therefore, PRSs in OU 1114 that consist of subsurface contamination above SALs will be evaluated in a baseline risk assessment using the construction worker and on-site worker scenarios. The types of PRS aggregates with potential subsurface contamination include: surface disposal, storm drains, USTs, outfalls, point/spot spills, and disposal pits.

Exposure pathways relevant to workers include: 1) inhalation of fugitive dust or volatile compounds; 2) incidental ingestion of contaminated soils; 3) direct dermal contact with contaminated soils; and 4) external radiation (Table 4-5).

TABLE 4-5

SUMMARY OF EXPOSURE ROUTES IN THE CONTINUED LABORATORY OPERATIONS SCENARIO

EXPOSURE ROUTE	ASSUMPTIONS
1. Inhalation of ambient air (fugitive dust or volatiles)	• Fugitive dust is generated by soil disturbances (i.e., bulldozers, trucks, and other earth-moving equipment) during construction activities • Construction activities may expose subsurface chemicals to the surface (i.e., excavation) • There may be volatile organic compounds in near-surface and subsurface soils that would contribute to the inhalation exposure • For dust transport indoors, it can be assumed that indoor concentrations are less than those outdoors • For vapor transport indoors, concentrations indoors and outdoors can be assumed to be equivalent, except at sites where subsurface soil gases are entering indoors; in this case, vapor concentrations inside could exceed those outdoors
2. Incidental ingestion of soil	• Incidental ingestion of surface or subsurface soils may occur as a result of construction activities • Office workers would be expected to contact much less soil and dust than construction workers
3. Dermal contact with soil or debris	• Skin surface area available for contact with soil includes arms, hands, face, and head
4. External radiation	• Irradiation from radionuclides on the ground surface or debris may occur

4.4.1.2 Recreational Scenario

The recreational scenario is a current scenario in some areas of OU 1114 and is the most probable future scenario for PRSs consisting of surface contamination (0 to 6 in.) on the canyon wall or canyon bottom. The recreational scenario may include camping, hiking, and hunting.

PRSs in OU 1114 that consist of surface contamination above SALs on canyon walls and/or canyon bottoms will be evaluated in a baseline risk assessment using the recreational scenario. PRSs that are located on the canyon walls and/or bottoms are primarily outfalls. PRSs that have surface water runoff into a drainage channel or an associated outfall, will also be evaluated using the recreational scenario.

Recreational users of the area could come into contact with COPCs through ambient air, surface soil, sediments in drainage channels, and pooled surface water.

Exposure pathways associated with recreational activities include: 1) inhalation of fugitive dust; 2) soil ingestion; 3) dermal contact with soil; 4) external radiation; 5) dermal contact with surface water; 6) incidental ingestion of surface water; and 7) ingestion of contaminated edible plants (piñon nuts and berries). No body of water large enough to support a consistent supply of game fish exists; therefore, exposure to contaminants by consuming contaminated fish is not a viable pathway for this site. Recreational exposure routes are further described in Table 4-6.

TABLE 4-6

SUMMARY OF EXPOSURE ROUTES IN THE RECREATIONAL SCENARIO

EXPOSURE ROUTE	ASSUMPTIONS
1. Inhalation of ambient air (fugitive dust or volatiles)	• Fugitive dust is generated by the wind and during recreational activities (e.g., dirt biking) • There may be volatile constituents on site that would contribute to the inhalation exposure
2. Incidental ingestion of soil/sediment	• Incidental ingestion of surface soil or sediments may occur as a result of recreational activities (standard daily soil ingestion rates for adults and children are used)
3. Dermal contact with soil/sediment/ debris	• Skin surface area available for contact includes arms, hands, face, legs, upper body, and head (the camping event occurs in warm weather).
4. External radiation	• Irradiation from radionuclides on the ground surface or debris may occur
5. Dermal contact with surface water	• Ephemeral streams may be present as a result of snowmelt and summer rainfall • Rainfall events result in pooled water • Standing water occurs after the rainfall event before it seeps into the ground
6. Accidental ingestion of surface water	• Ephemeral streams may be present as a result of snowmelt and summer rainfall • Rainfall events result in pooled water • Standing water occurs after the rainfall event before it seeps into the ground
7. Ingestion of produce	• Piñon nuts and wild berries growing in the canyon may have taken up contaminants from soil/runoff

Table 4-5 is 5.5" Table 4-6 is ~4.75". Both should be 5.5". Table 4-7 is also ~4.75. Table 4-5, 4-6, & 4-7 should be the same [illegible] 4-7.

4.4.1.3 Residential Scenario

The residential scenario is considered an unlikely future land-use scenario for OU 1114; however, ~~since~~ because residential development cannot be ruled out, this potential exposure scenario must be considered. Potential future on-site residents would be exposed routinely to near-surface soils through activities such as recreation and gardening; therefore, this scenario is considered a conservative exposure scenario for ~~these~~ the PRSs in OU 1114 that consist of

potential surface contamination (0 to 6 in.) on the mesa top. Surface contamination above SALs will be evaluated for both current and future risks in a baseline risk assessment using the on-site residential scenario.

The on-site resident may also be exposed to subsurface contamination if it is brought to the surface during excavation for a home, or may be exposed to subsurface volatile contamination that migrates in vapor form into the on-site residence. Therefore, PRSs in OU 1114 that consist of subsurface contamination above SALs will be evaluated in a baseline risk assessment using the on-site residential scenario.

The potentially applicable exposure routes for a resident are described in Table 4-7.

TABLE 4-7

SUMMARY OF EXPOSURE ROUTES IN THE RESIDENTIAL SCENARIO

EXPOSURE ROUTE	ASSUMPTIONS
1. Inhalation of ambient air (fugitive dust or volatiles)	• There may be volatile organic compounds in near-surface and subsurface soils that would contribute to the inhalation exposure • For dust transport indoors, it can be assumed that indoor concentrations are less than those outdoors • For vapor transport indoors, concentrations indoors and outdoors can be assumed to be equivalent, except at sites where subsurface soil gases are entering indoors; in this case, vapor concentrations inside could exceed those outdoors
2. Incidental ingestion of soil/sediment	• Incidental soil ingestion of surface or subsurface soil may occur as a result of residential activities • Children would be expected to ingest more soil and dust than adults
3. Dermal contact with soil/sediment/ debris	• Skin surface area available for contact includes arms, hands, face, legs, upper body, head, feet and legs
4. External radiation	• Irradiation from radionuclides on the ground surface or debris may occur
5. Dermal contact with surface water	• Ephemeral streams may be present as a result of snowmelt and summer rainfall • Rainfall events result in pooled water • Standing water occurs after the rainfall event before it seeps into the ground
6. Incidental ingestion of surface water	• Ephemeral streams may be present as a result of snowmelt and summer rainfall • Rainfall events result in pooled water • Standing water occurs after the rainfall event before it seeps into the ground
7. Ingestion of piñon nuts and berries	• Produce from home gardens may take up contaminants from soil/surface water • Piñon nuts and wild berries may have taken up contaminants from soil/runoff

4.5 Identifying Chemicals of Potential Concern

The first step in evaluating risks at a site is to identify the COPCs. COPCs are defined as chemicals, resulting from current or past activities, that are detected above reportable levels or at concentrations above naturally occurring levels and that have been determined not to be sampling or laboratory artifacts.

The objectives of the Phase I sampling activity, or screening assessment, are to accomplish the following:

1. Confirm the presence or absence of anticipated COPCs from known site activities;

2. Use broad-spectrum analytical methods that will allow for a reasonable determination that additional COPCs are not present (e.g., the evaluation of tentatively identified compounds from mass spectral scans);

3. Select analytical methods primarily on the basis of sensitivity for anticipated COPCs at their SALs and secondarily for broad-band spectrum capability; and,

4. Estimate if the concentration of each COPC is greater than some method threshold.

Chemical constituents that are essential human nutrients such as potassium and magnesium, may also be screened if they are present at concentrations that are not toxic (EPA 1989, 0305).

The main classes of COPCs identified for OU 1114 are VOCs, semivolatile organic compounds (SVOCs), metals, and radionuclides. These categories correspond to a method of analysis used to quantify their presence in samples. Section 7.0 of Appendix D, Sampling Methods, lists the LANL ER standard operating procedures used for these standard suites of chemicals. Types of VOCs found at OU 1114 include solvents and chemicals used in laboratory projects. SVOCs that may be found at OU 1114 include PCBs used in transformers. Pesticides and herbicides were also stored, handled, or applied at specific locations. These substances are measured by specific analytical suites.

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Executive Summary

Chapter 1
Introduction

Chapter 2
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Chapter 3
Environmental Setting

Chapter 4
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Chapter 5
Evaluation of PRS Aggregates

Chapter 6
PRSs Recommended for No Further Action or Deferred Action

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Appendixes

Chapter 4

RFI Work Plan (1993)

- Aggregation of Potential Release Sites (PRSs)
- Approaches to Site Characterization
- Conceptual Exposure Models
- Potential Response Actions and Evaluation Criteria
- Sampling Strategies
- Analytical Methods

Addendum 1

- Aggregation of Potential Release Sites
- Site Characterization Decision Model
- Sitewide Investigation Approach
- Conceptual Site Model for OU 1117

4.0 TECHNICAL APPROACH

4.1 Aggregation of Potential Release Sites (PRSs)

The potential release sites (PRSs) to be evaluated in this Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) work plan were aggregated for Operable Unit (OU) 1114 by proximity, physical similarity, and similarity of historical use. Chapter 5 in the RFI Work Plan for OU 1114 covered 10 aggregates composed of 53 PRSs (LANL 1993, 1090). Chapter 5 in Addendum 1 to the RFI Work Plan for OU 1114 covers 16 aggregates composed of 25 PRSs. Table 4-1 lists aggregates in Chapter 5 of Addendum 1, the PRS numbers, and generic strategies used for aggregation. The first digit(s) of the solid waste management unit (SWMU) or area of concern (AOC) number identifies the technical area in which it is located. Table 4-2 lists PRSs discussed in Chapter 6 of Addendum 1 that are candidates for no further action (NFA) or deferred action (DA), including criteria used for these decisions. An NFA decision that is based on absence of human health risk does not imply that ecological risks do not exist. Ecological risk assessment process is described in Subsection 4.5.

4.2 Site Characterization Decision Model

This work plan adheres to the Laboratory's Environmental Restoration (ER) Project technical approach for data collection and evaluation as documented in Chapter 2 of the Installation Work Plan (IWP) (LANL 1993, 1017). This technical approach is an efficient, defensible, and effective method of data collection for support of environmental decision-making. The Laboratory's approach is an adaptation of the Department of Energy's (DOE) streamlined approach for environmental restoration (SAFER) which combines elements of the data quality objectives (DQO) process (Chapter 4 of the IWP) and the observational approach (Appendix G of the IWP) (LANL 1993, 1017). At Los Alamos National Laboratory (LANL), these tools are applied within the framework of a project-wide decision flow (Fig. 4-1) which uses human health and environmental risk as the basis for site-specific decision-making.

TABLE 4-1

AGGREGATES IN CHAPTER 5, ADDENDUM 1

SWMU OR AOC NUMBER	AGGREGATE DESCRIPTION	SUBSECTION	BASIS OF AGGREGATION	NUMBER PRSs AGGREG
3-054(e), C-3-006	Outfall	5.12	C-3-006 is source to 3-054(e)	2
3-049(a)	Outfall	5.13	NA	1
3-021	Outfall	5.14	NA	1
3-052(b), 3-056(k)	Storm drain and storage area	5.15	3-056(k) is source to 3-052(b)	2
3-054(b), 3-052(a,e)	Outfall	5.16	3-052(a,e) are sources to 3-054(b)	3
3-001(e)	Storage area	5.17	NA	1
~~3-051(c) 3-056(l)~~	~~Vacuum pump exhaust stains~~	~~5.18~~	~~Proximity~~	~~2~~
3-049(b), C-3-014	Outlet discharge area and equipment storage area	5.~~19~~ 18	Proximity	2
~~3-047(d)~~	~~Storage area~~	~~5.20~~	~~NA~~	~~1~~
~~3-003(p)~~	~~Storage area~~	~~5.21~~	~~NA~~	~~1~~
3-059, 3-003(n)	Salvage yard	5.~~22~~ 19	Proximity	2
~~3-029(m), 3-036(n), C-3-036~~ 3-001(j)	Storage area ~~tanks, and landfill~~	5.~~23~~ 20	Related to the Asphalt Batch Plant	~~4~~ 6
3-034(a)	Radioactive waste tanks	5.~~24~~ 21	NA	1
3-007	Firing site	5.~~25~~ 22	NA	1
3-004(c,d)	Dumpster areas	5.~~26, 27, 28, 29, 30~~	Similarity	2
~~C~~3-053	Duplicate of SWMU 3-015	5.~~27~~ 24	NA	1
3-052(f)	Duplicate of SWMUs 3-013(a,b)	5.~~28~~ 25	NA	1
~~C~~3-042	Duplicate of SWMU 3-003(a)	5.~~29~~ 26	NA	1
3-045(b,c)	Duplicates of SWMU 3-012(b)	5.~~30~~ 27	Proximity	2

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Table 4-2 will be replaced with an updated Table 4-2 No need to make any changes to the table in this draft. 06-23-95.

TABLE 4-2

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION[a] IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
NO	3-001(d)	TA-3-170	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(f)	TA-3-038	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(g)	TA-3-473	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(h)	TA-3-066	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(j)	TA-3-034	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(l)	TA-3-316	Storage area	6.4.1.3	1	No RCRA or hazardous wastes/substances
NO	3-001(n)	TA-3-032	Satellite accumulation	6.4.1.3	3	Approved accumulation area
NO	3-001(o)	TA-3-035	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(q)	TA-3-043	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(s)	TA-3-494	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(t)	TA-3-502	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(u)	TA-3-1485	Satellite accumulation	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	3-001(v)	TA-3-1486	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(w)	TA-3-1888	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(x)	TA-3-022	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(y)	TA-3-029	Satellite accumulation	6.4.3.5	3	Approved accumulation area
YES	3-002(a)	TA-3-066	Satellite accumulation	6.4.3.5	3	Approved accumulation area
YES	3-002(d)	TA-3-040	Drum storage	6.4.2.3	2	No release to environment
NO	3-003(d)	TA-3-141	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority

TABLE 4-2 (Continued)

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
NO	3-003(e)	TA-3-029	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(f)	TA-3-066	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(g)	TA-3-035	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(h)	TA-3-039	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(i)	TA-3-032	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(j)	TA-3-040	PCB-containing capacitors, transformers, drums	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(k)	TA-3-316	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(l)	TA-3-016	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(m)	TA-3-022	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority

TABLE 4-2 (Continued)

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
NO	3-003(o)	TA-3-287	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-004(a)	TA-3-029	Drum storage/ temporary	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-004(b)	TA-3-029	Drum storage	6.4.1.2	1	No RCRA or hazardous wastes/substances
NO	3-004(e)	TA-3-029	Satellite accumulation	6.4.1.2	1	No RCRA or hazardous wastes/substances
NO	3-004(f)	TA-3-029	Satellite accumulation	6.4.1.2	1	No RCRA or hazardous wastes/substances
NO	3-005		Renumbered; addressed in 1993 RFI Work Plan	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	3-006(a)	TA-3-012	HE-associated	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	3-008(a)	Old TA-3	HE-associated	6.4.1.3	1	No RCRA or hazardous wastes/substances
NO	3-008(b)	TA-3-43	HE-associated	6.4.2.5	2	No release to environment
YES	3-009(i)	TA-3-170	Debris pile	6.4.1.1	1	No RCRA or hazardous wastes/substances
YES	3-009(j)	TA-3-142	Debris pile	6.4.1.1	1	No RCRA or hazardous wastes/substances
YES	3-011	TA-3-031 TA-3-101	Outfall	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-016(a)	TA-3-130 TA-3-1484	Septic tank & seepage pit	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-016(b)	TA-3-272	Septic tank	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-016(c)	TA-3-079	Septic tank	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-016(d)	TA-3-443	Septic pit	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-016(e)	TA-3-1639	Lift station	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	3-016(f)	TA-3-1617	Septic pit	6.4.1.4	1	No RCRA or hazardous wastes/substances

TABLE 4-2 (Continued)

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
YES	3-019	TA-3-016 TA-3-015	Septic tank	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-022	TA-3-316	Sump	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-023	TA-3-105 TA-3-148	Sump pit	6.4.2.4	2	No release to environment
YES	3-024	TA-3-141 TA-3-174	Pump pit	6.4.2.4	2	No release to environment
YES	3-025(a)	TA-3-034	Oil trap sump	6.4.1.3	1	No RCRA or hazardous wastes/substances
YES	3-025(b)	TA-3-102	Oil trap	6.4.2.1	2	No release to environment
NO	3-025(c)	TA-3-039	Sump	6.4.2.1	2	No release to environment
YES	3-026(b)	TA-3-132	Sump	6.4.1.1	2	No release to environment
YES	3-026(c)	TA-3-029	Sump	6.4.2.1	2	No release to environment
NO	3-027	TA-3-036	Sump/lift wells	6.4.2.5	4	No threat-characterized/ remediated
NO	3-030	TA-3-066	Temporary pit; addressed in RFI Work Plan	6.4.1.4	1	No RCRA or hazardous wastes/substances
YES	3-031	TA-3-029	Sump	6.4.5	DA	No release to environment
YES	3-032	TA-3-038	Aboveground storage tank	6.4.2.4	2	No release to environment
YES	3-034(b)	TA-3-141	Contaminated soil	6.4.2.1	2	No release to environment
NO	3-036(f)	TA-3-070	Aboveground storage tank	6.4.2.2	2	No release to environment
NO	3-036(g)	TA-3-022	Aboveground storage tank	6.4.3.2	3	Site regulated or closed under different authority
NO	3-036(h)	TA-3-022	Aboveground storage tank	6.4.2.4	2	No release to environment
NO	3-036(i)	TA-3-022	Aboveground storage tank	6.4.4.2	4	No threat-characterized/ remediated
NO	3-036(j)	TA-3-022	Aboveground storage tank	6.4.3.2	3	Site regulated or closed by different authority
NO	3-038(c)	TA-3-028	Industrial waste line left in place	6.4.3.4	3	Site regulated or closed by different authority

TABLE 4-2 (Continued)

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
NO	3-038(e)	TA-3-065	Sink drains	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-038(f)	TA-3-1502	Industrial waste line left in place	6.4.5	DA	Active; no pathway to environment
NO	3-040(a)	TA-3-030	Photographic film	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-040(b)	TA-3-043	Photographic film	6.4.2.5	2	No release to environment
NO	3-041	TA-3-066	Holding tank	6.4.2.1	2	No release to environment
NO	3-043(a)	TA-3-070	Storage tank	6.4.2.2	2	No release to environment
NO	3-043(b)	TA-3-070	Storage tank	6.4.2.2	2	No release to environment
YES	3-043(c)	TA-3-040 TA-3-718	Storage tank	6.4.4.2	4	No threat-characterized/ remediated
NO	3-043(d)	TA-3-070	Aboveground storage tank	6.4.1.4	1	No RCRA or hazardous wastes/substances
[illegible]O	3-043(f)	TA-3-070	Storage tank	6.4.2.2	3	Site regulated or closed under different authority
NO	3-043(g)	TA-3-070	Storage tank	6.4.4.2	4	No threat-characterized/ remediated
NO	3-043(h)	TA-3-070	Aboveground storage tank	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	3-043(i)	TA-3-040 TA-3-93	Storage tank	6.4.3.1	3	Site regulated or closed under different authority
NO	3-044(a)	TA-3-70	Storage area	6.4.2.2	2	No release to environment
YES	3-045(a)	TA-3-022	Outfall	6.4.3.4	3	Site regulated or closed under different authority
YES	3-045(d)	TA-3-022	Aboveground storage tank	6.4.1.4	1	No RCRA or hazardous wastes/substances
YES	3-045(e)	TA-3-057	Outfall	6.4.1.1	1	No RCRA or hazardous wastes/substances
YES	3-045(f)	TA-3-223	Outfall from drain	6.4.1.1	1	No RCRA or hazardous wastes/substances
YES	3-045(g)	TA-3-073	Outfall	6.4.3.4	3	Site regulated or closed under different authority
YES	3-045(h)	TA-3-066 TA-3-187	Outfall	6.4.3.4	3	Site regulated or closed under different authority
[illegible]ES	3-045(i)	TA-3-034	Outfall	6.4.1.1	1	No RCRA or hazardous wastes/substances

TABLE 4-2 (Continued)

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
YES	3-046	TA-3-022	Aboveground storage tank	6.4.3.2	3	Site regulated or closed under different authority
NO	3-047(a)	TA-3-236	Storage	6.4.1.3	1	No RCRA or hazardous wastes/substances
NO	3-047(b)	TA-3-070	Storage	6.4.2.2	2	No release to environment
NO	3-047(c)	TA-3-070	Drum storage	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-047(e)	TA-3-1963	Storage	6.4.2.2	2	No release to environment
NO	3-047(f)	TA-3-070	Storage	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-047(g)	TA-3-141	Drum storage	6.4.2.3	2	No release to environment
NO	3-047(h)	TA-3-170	Waste oil leaks, spills	6.4.2.3	2	No release to environment
NO	3-047(i)	TA-3-216	Satellite accumulation	6.4.2.5	2	No release to environment
NO	3-047(j)	TA-3-016	Drum storage	6.4.4.1.4	4	No threat-characterized/ remediated
NO	3-047(k)	TA-3-374	Drum storage	6.4.1.1	4	No threat-characterized/ remediated
NO	3-048	TA-3-029	Satellite accumulation	6.4.1.2	1	No RCRA or hazardous wastes/substances
YES	3-049(c)	TA-3-066	Outfall	6.4.3.4	3	Site regulated or closed by different authority
YES	3-049(d)	TA-3-066	Outfall	6.4.3.4	3	Site regulated or closed by different authority
YES	3-049(e)	TA-3-066	Outfall	6.4.1.4	1	No RCRA or hazardous wastes/substances
YES	3-050(a)	TA-3-029	Exhaust emissions	6.4.1.2	1	No RCRA or hazardous wastes/substances
YES	3-050(b)	TA-3-034	Exhaust emissions	6.4.1.2	1	No RCRA or hazardous wastes/substances
YES	3-050(c)	TA-3-35	Exhaust emissions	6.4.1.2	1	No RCRA or hazardous wastes/substances
YES	3-050(d)	TA-3-102	Exhaust emissions	6.4.1.2	1	No RCRA or hazardous wastes/substances
YES	3-050(e)	TA-3-39	Exhaust emissions	6.4.1.2	1	No RCRA or hazardous wastes/substances
YES	3-050(f)	TA-3-40	Exhaust emissions	6.4.1.2	1	No RCRA or hazardous wastes/substances

TABLE 4-2 (Continued)

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
YES	3-050(g)	TA-3-16	Exhaust emissions	6.4.1.2	1	No RCRA or hazardous wastes/substances
NO	3-051(a)	TA-3-039	Oil from leaking compressor	6.4.3.3	3	Site regulated or closed by different authority
NO	3-051(b)	TA-3-102	Oil/leaking compressor	6.4.3.3	3	Site regulated or closed by different authority
NO	3-051(d)	TA-3-040	Oil/leaking compressor	6.4.1.1	1	No RCRA or hazardous wastes/substances
YES	3-052(c)	TA-3-422	Storm drains	6.4.4.1	4	One-time release
NO	3-052(d)	TA-3-287	Storm drains	6.4.3.3	3	Site regulated or closed by different authority
YES	3-054(a)	TA-3-016 TA-3-019	Outfall	6.4.3.4	3	Site regulated or closed by different authority
YES	3-054(c)	TA-3-105 TA-3-156	Outfall	6.4.3.4	3	Site regulated or closed by different authority
[illegible]ES	3-054(d)	TA-3-016 TA-3-208	Outfall	6.4.3.4	3	Site regulated or closed by different authority
YES	3-055(a)	TA-3-016	Outfall	6.4.1.1	1	No RCRA or hazardous wastes/substances
YES	3-055(c)	TA-3-041	Outfall	6.4.1.3	1	No RCRA or hazardous wastes/substances
YES	3-055(d)	TA-3-059	Outfall	6.4.1.3	1	No RCRA or hazardous wastes/substances
NO	3-056(b)	TA-3-70	Storage area	6.4.2.2	2	No release to environment
YES	3-056(d)	TA-3-047	Drum storage	6.4.2.3	2	No release to environment
NO	3-056(e)	TA-3-34	Satellite storage	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	3-056(f)	TA-3-316	Drum storage	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	3-056(g)	TA-3-016	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-056(h)	TA-3-105 TA-3-287	PCB-containing capacitors and transformers	6.4.3.3	4	No threat-characterized/ remediated
NO	3-056(i)	TA-3-038	Drum storage	6.4.2.3	2	No release to environment
[illegible]O	3-056(j)	TA-3-473	Storage	6.4.1.1	1	No RCRA or hazardous wastes/substances

TABLE 4-2 (Continued)

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	CRITERION	RATIONALE
YES	3-056(m)	TA-3-322	Drum storage	6.4.1.1	1	No RCRA or hazardous wastes/substances
YES	3-056(n)	TA-3-379	Drum storage	6.4.2.3	2	No release to environment
NO	3-057	TA-3-100 TA-3-688	Grease trap	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-058	TA-3-029	Satellite accumulation	6.4.1.2	1	No RCRA or hazardous wastes/substances
NO	C-3-001	TA-3-28 TA-3-1872	Gas trap	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	C-3-002	TA-3-035	Leak from asphalt machine	6.4.4.1	4	One-time release
NO	C-3-003	TA-3-039	Stained asphalt	6.4.4.1	4	One-time release
NO	C-3-004	TA-3-066	Misc. debris	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	C-3-005	TA-3-073	Storm drains	6.4.4.1	4	No threat-characterized/ remediated
NO	C-3-007	TA-3-035	Storage	6.4.1.2	1	No RCRA or hazardous wastes/substances
NO	C-3-008	TA-3-164	Storage/rad contaminated	6.4.1.2	1	No RCRA or hazardous wastes/substances
NO	C-3-009	TA-3-169	Storage	6.4.2.5	2	No release to environment
NO	C-3-010	TA-3-019	Outfall	6.4.2.5	2	No release to environment
NO	C-3-011	TA-3-070	Storage tank	6.4.2.2	2	No release to environment
NO	C-3-012	TA-3-029	Satellite accumulation	6.4.2.5	1	No RCRA or hazardous wastes/substances
NO	C-3-015	TA-3-036	Underground storage tank	6.4.3.1	3	Site regulated or closed under different authority
NO	C-3-017	TA-3-028	Underground storage tank	6.4.3.1	3	Site regulated or closed under different authority
NO	C-3-018	~~TA-3-028~~ TA-3-157	Underground storage tank	6.4.3.2	3	Site regulated or closed under different authority
NO	C-3-019	TA-3-016	Underground storage tank	6.4.1.3	1	No RCRA or hazardous wastes/substances
NO	C-3-021	TA-3-016 TA-3-191	Underground storage tank	6.4.3.1	3	Site regulated or closed under different authority

Aa: WT is actually aboveground! and not in TA-3-157

TABLE 4-2 (Continued)

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
NO	C-3-022	TA-3-070	Kerosene tanker trailer	6.4.2.2	2	No release to environment
NO	C-59-001	TA-59-184	PCB-containing capacitors and transformers	6.4.3.3	3	Site regulated or closed under different authority
NO	C-3-020	TA-3-105	Storage tanks	6.4.3.1	3	Site regulated or closed under different authority
NO	C-60-001	TA-60-1 TA-3-382	Storage tank	6.4.3.1	3	Site regulated or closed under different authority
NO	C-60-002	TA-60-45	Storage tank	6.4.3.1	3	Site regulated or closed under different authority
NO	C-60-003	TA-60-29	One-time release at post shed	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	C-60-004	TA-60-1	Storage tank	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	C-61-001	TA-61-23	PCB oil leak	6.4.1.4	1	No RCRA or hazardous wastes/substances

[a]Environmental Restoration Project 1995, 1173.

In this approach, investigations are phased to address decisions in a sequential manner, where each decision brings the efforts at OU 1114 closer to the ultimate goal of selecting and implementing an appropriate corrective action. The LANL ER Project decision sequence (Fig. 4-1) is applied, along with a series of corresponding technical assumptions, to each decision. The decision flow translates each phase of the RCRA corrective action process into an operational sequence of questions (i.e., it addresses each phase of the corrective action process by identifying one or more decisions that can be made based on the collection and evaluation of defensible data sets). The decision flow and technical assumptions were formally discussed and approved by a task force consisting of senior representatives from DOE, the Environmental Protection Agency (EPA), Region 6, New Mexico Environment Department (NMED), LANL, and Sandia National Laboratory.

hydro, took to Audi for explosion of acronyms 02-10-95.

Fig. 4-1. Framework for project-wide decision flow.

4.3 Sitewide Investigation Approach

DQOs are requirements that specify the quality of data collected during the RFI. The formal DQO planning approach developed by EPA consists of seven steps, which include: 1) state the problem, 2) identify the decision, 3) identify inputs to the decision, 4) define the study boundaries, 5) develop a decision rule, 6) specify limits on decision uncertainty, and 7) optimize the design for collecting data. The sampling and analysis plans for most PRSs are based on the screening assessment decision in which DQO inputs are prespecified; therefore, a formal DQO process is not followed for these PRSs. The prespecified generic DQO inputs for screening assessment decisions are presented below, along with the description of the approach used to specify DQOs for all PRSs in Chapter 5, Addendum 1.

4.3.1 State the Problem

The purpose of the first step of the DQO process is to summarize what is known about the potential contamination problem at each PRS. Archival information is compiled and evaluated and field reconnaissance visits are made to formulate a conceptual mode. This information is summarized in the description and history subsection for each aggregate in Chapter 5, Addendum 1. These historical data help develop a list of chemicals of potential concern (COPCs), summarized in Table 4-3, and a conceptual exposure model for each aggregate, which is discussed in Subsection 4.4 of this chapter.

4.3.2 Identify the Decision

After the description and history have been documented, the next step in the DQO process is to identify the decision to be made. The planning team determines where each PRS in the RCRA decision sequence falls (Fig. 4-1). As noted above, PRSs are sampled to evaluate the site screening or screening assessment decision (Fig. 4-2). The generic screening assessment decision statement objective is to determine if there has been a release at the PRS where the environmental concentration exceeds conservative screening levels.

TABLE 4-3

BACKGROUND AND SCREENING ACTION LEVELS FOR REGULATED SUBSTANCES AT OU 1114

~~POTENTIAL CONTAMINANTS OF~~ CONCERN	CRQL[a] (mg/kg)	UPPER TOLERANCE LIMITS FOR LANL SOIL BACKGROUND (mg/kg)	SCREENING ACTION LEVEL IN SOIL (mg/kg)
Metals			
Antimony	12[b]	LNA	32
Arsenic	2	11.6	[illegible]
Barium	40	1 140	5 600
Beryllium	1[b]	3.31	[illegible]
Cadmium	1	NA	80
Chromium III	2	NA	80 000
Chromium VI	2	NA	400
Cyanide	2	0	1 600
Lead	0.6	39	400[e]
Mercury	0.04	NA	24
Nickel	8	26.7	1 600
Silver	2	NA	400
Uranium (natural)	NA	NA	66
Volatile organic compounds			
Acetone	0.01	0	8 000
Benzene	0.01[b]	0	0.67
Ethylbenzene	0.01	0	3100
Toluene	0.01	0	910
Trichloroethene	0.01	0	3.2
1,1,1-Trichloroethane	0.01	0	1 000
1,1,2-Trichloroethane	0.01	0	6.3
Xylene	0.01	0	160,00
Semivolatile organic compounds			
Benzo(a)pyrene	0.33[b]	0	0.10
Herbicides	NA	NA	NA
PCBs	NA	0	0.09
Pesticides	NA	NA	NA
Phenol	0.33	0	48 000
Radionuclides (pCi/g)	CRQL (pCi/gm)	REGIONAL BACKGROUND (pCi/gm)	SCREENING ACTION LEVEL (pCi/gm)
Cesium-137	Not required	0.43 /64[b,f]	4[e,g]
Plutonium-238	Not required	0.001/76[b,f]	20[e,g]
Plutonium-239	Not required	0.007/76[b,f]	18[e,g]
Tritium	Not required	0.98/43[b,f,h]	810[e,g]
Uranium-235	Not required	NA	18[e,g]

Au: "g" indicates gram. I assume that is what you intended.

Move Fig 4-2 to this page. It is first called out on p 13.

6-1-95 A. Dorries said that we have COCs but not PCOCs. MAJ

In some cases the PRS archival data is adequate to focus the investigation on a particular set of contaminants. For example, at capacitor storage sites a defensible approach may be to focus the study on polychlorinated biphenyls (PCBs) alone. If the historical data are uncertain, a complete analyte suite may be needed to determine the list of constituents of concern (COCs). If fewer analytes than the standard list of RCRA analytes are being analyzed at a PRS, then the information supporting a reduced analyte suite will be included in the investigation approach and objectives subsection for each aggregate in Chapter 5, Addendum 1.

4.3.4 Define the Study Boundaries

The generic screening assessment decision boundary states that the spatial domain is the boundaries of the PRS as defined in the (Facility for Information Management Analysis, and Display) (FIMAD) database. Samples submitted for laboratory analysis will be collected from the portion of the soil (or bedrock) horizon that is most likely to contain COPCs. For example, samples collected for volatile organic ~~chemicals~~ compounds (VOCs) will be from deep surface corings (greater than six inches depth). Temporal variation is not an issue for sampling ~~of~~ any PRS. This generic statement applies to all PRSs in Chapter 5, Addendum 1. The rationale for PRS-specific soil sampling depths is presented in Subsection 5.0~~, and in~~ and the investigation approach and objectives subsection for each aggregate in Chapter 5, Addendum 1.

Are we to change to compounds?

4.3.5 Decision Logic

The main goal of the screening assessment is to determine if there are any COCs in site media (Fig. 4-2). The generic screening assessment decision rule statement declares: if the maximum concentration of all hazardous constituent concentrations ~~are~~ is below the screening action levels (SALs) or background concentrations, then propose ~~no further action~~ NFA for this PRS. Before proposing NFA for a site, the data will be reviewed for multiple constituents that are marginally less than the SAL. If any hazardous constituent concentration is greater than the SAL or background concentrations, then either conduct a Phase II RFI investigation, a VCA, or proceed to a corrective measures study (CMS) for this PRS. ~~The selection and~~ due koning

Comparison to LANL Background will be made according to guidance provided in the Project Planning Phase. Statistical comparisons to Background, Part 1 (ER Project Assessments Council 1995, 1218)

~~(ER Project Assessments Council 1-19-95, 1218)~~

a Contract-required quantitation limits (CRQLs) for soil [Appendix J of IWP (LANL 1993, 1017)]

b The SAL is less than the CRQL; therefore, special analytical services may be required.

d Background comparison should be performed for this compound to determine if further action is required

e NA = Not available

e Soil ~~screening action level~~ (SAL) based on EPA OSWER Directive 9355.4-12, "Revised Interim Guidance on Establishing Lead Cleanup Levels at Superfund Site," (EPA 1994, ~~17~~ 1209) ~~XXX~~.

~~f IDL = Individual CRQL not available for contaminant group listed.~~

~~g SAL = Individual SAL not available for contaminant group listed.~~

f Purtymun et al. 1987, 0211

g Determined by Laboratory risk assessment committee

h Assuming 10% soil moisture

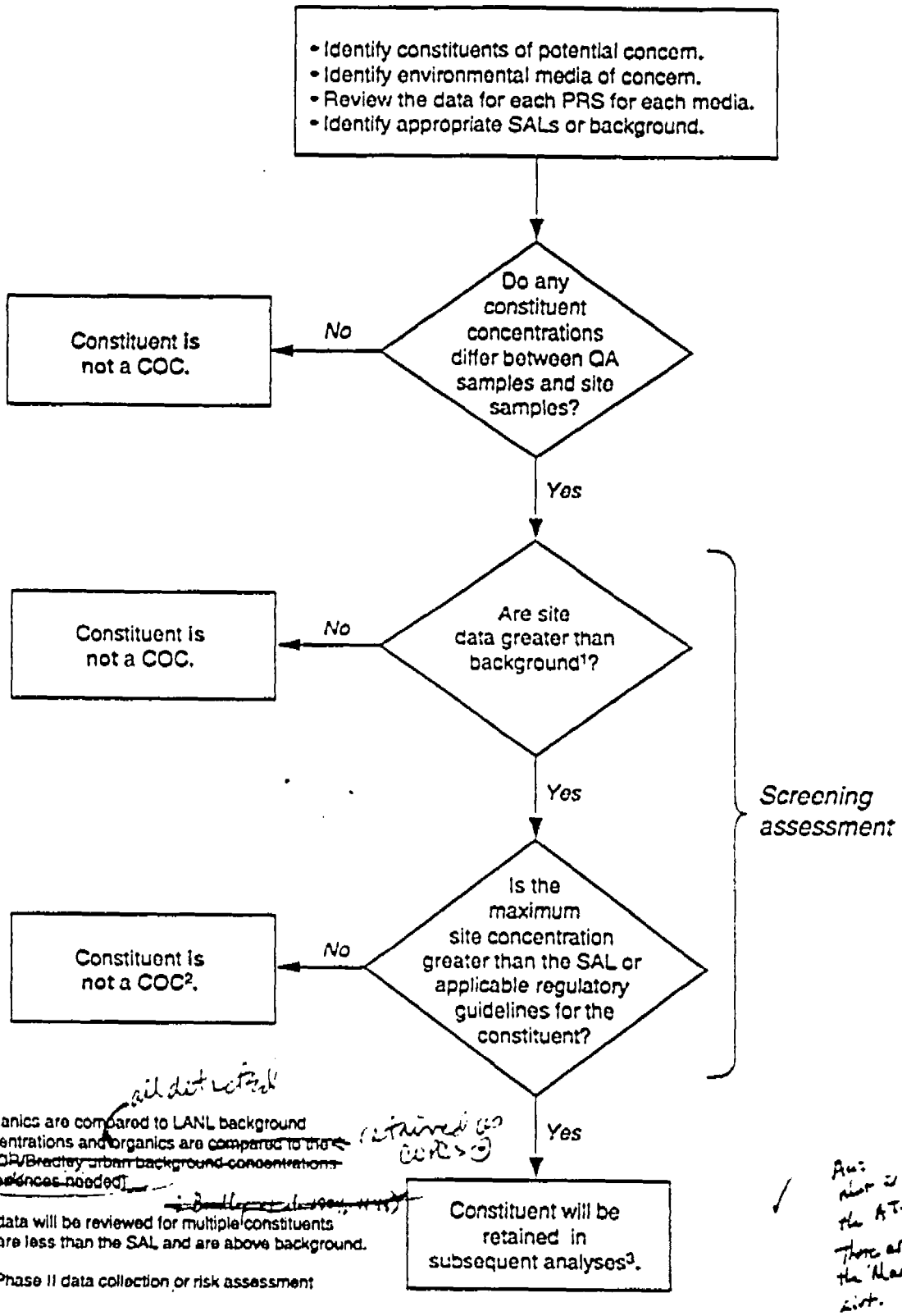
For certain PRSs, historical information is adequate to identify potential contaminants and estimate the volume of contaminated media. For these PRSs, it is more efficient to collect sufficient data to ~~either~~ conduct a voluntary corrective action (VCA) or to conduct the RFI Phase I and Phase II investigations within a single field mobilization. Such exceptions to the generic screening assessment decision statement will be documented in the investigation approach and objectives subsection for each aggregate in Chapter 5, Addendum 1.

an expedited cleanup (EC),

Aug: I thought that we no longer have VCAs only ECs. Is that correct?

4.3.3 Identify Decision Inputs

After specifying the decision to be made, the ~~next~~ third step of the DQO process involves identifying the inputs to the decision. The objective is to identify all informational inputs ~~that will be~~ required to resolve the decision [including, when possible, the screening action level(s)] and to list all the environmental variables or characteristics that need to be measured to provide ~~the type of~~ information ~~needed~~ required to make the decision. The generic screening assessment decision input states that the decision inputs include the screening action levels or background levels for each potential contaminant. In cases where screening action levels are not available, they will be calculated.



[1]Inorganics are compared to LANL background concentrations and organics are ~~compared to the ATSDR/Bradley urban background concentrations [References needed]~~

[2]Site data will be reviewed for multiple constituents that are less than the SAL and are above background.

[3]RFI Phase II data collection or risk assessment

Fig. 4-2. Screening assessment flow chart.

Phase II, VCA, or CMS will be made based on the ability to conduct a baseline risk assessment with Phase I data and the availability of an obvious remedy for the site. Decision rules for sites where screening assessment is not planned will be presented in the investigation approach and objectives subsection for each aggregate in Chapter 5, Addendum 1.

SALs are media-specific, risk-based concentration levels for potential contaminants derived using conservative criteria. The motivation for developing SALs is to have a tool for effective discrimination between problem and non-problem sites so that resources are used effectively. SALs for the primary COPCs at OU 1114 are provided in Table 4-3. In most cases, SALs for non-radiological constituents are based on the methodology in Proposed Subpart S of RCRA to calculate action levels (EPA 1990, 0432). Radiological SALs are based on a 10 mrem per year dose using a conservative residential-use exposure scenario. SALs for radionuclides can be derived using the residual radioactive material (RESRAD) model that has been developed for the DOE (Yu et al. 1993, 1014). However, if a regulatory standard exists and is lower than the value derived by these methods, this lower value will be used for the SAL. The derivation of SALs and their values is discussed in Appendix J of the IWP (LANL 1993, 1017).

Comparisons to background will be made for constituents where the LANL background concentration is greater than the SAL. Constituents where the SAL is lower than LANL background include arsenic and beryllium. Statistical comparisons of site data to LANL background data will be made to determine if site data are significantly greater than background. Two types of comparisons will be made. One comparison will determine if site data tend to be greater than appropriate background data and the second comparison will determine if there any individual site values are significantly greater than the upper limit of background. The appropriate background data will be defined by the sample soil horizon and the iron concentration in the PRS soil sample data. Iron has been found to be strongly correlated to arsenic and beryllium concentrations in LANL background soils (Longmire et al. 1993, 0958).

It is important to note that PRS decisions beyond the screening assessment will not be made based on the maximum observed value. SALs are not cleanup levels; cleanup levels will be based on site-specific risk evaluations and as low as reasonably achievable (ALARA) criteria. Risk assessment is typically based on the 95% upper confidence limit of the average concentration. The LANL approach adopts the Superfund risk assessment guidance (EPA 1991, 0746) for chemical constituents and DOE's RESRAD

Fig. 4-2. Screening assessment flow chart.

model (Yu et al. 1993, 1014). In both cases the average concentration within appropriate exposure units (EUs) should be used as input to the decision.

If the site investigation results in a determination that remediation is necessary, the remediation alternatives selected must achieve acceptable risk levels. Choices between alternatives that meet the human health risk requirements will be based on additional factors such as ecological impact, cost, socioeconomic impacts, public/community input, regulatory concerns (in addition to risk), and impact on Laboratory operations (Appendix I of the IWP) (LANL 1993, 1017). Note that all actions refer to potential or known surface and subsurface soil problems. There is no indication that other media are contaminated which might require other technologies (e.g., steam injection for vadose zone contaminants).

A PRS may be proposed for NFA if: 1) no COCs are known or found to be present at concentrations above SALs or background (whichever is appropriate) based on historical data or Phase I sampling; 2) releases of COCs are judged not to have taken place and are unlikely to take place in the future; or, 3) some other regulatory program takes precedence. NFA designations are possible at any point in the remedial process. Chapter 6, Section 6.0 briefly presents the basis for NFA and DA decisions for PRSs in this work plan. The PRSs addressed by these criteria are listed in Table 4-2. Appendix I, Subsection 4.1 of the IWP presents a detailed discussion of the rationale for NFA or DA based on archival information (LANL 1993, 1017).

During the development of this RFI work plan, VCAs will be undertaken when necessary to protect the health and safety of the public and Laboratory personnel, when waste site conditions are such that a VCA is an appropriate response to stop further migration or dispersion of contaminants into the environment, or when cost-effective. In units of limited area where hazardous constituents are known or suspected, corrective action (e.g., removal of soil into 55-gal. drums) will be initiated, guided by field screening to the point where regulatory cleanup is accomplished. After the corrective action is complete, confirmatory samples will be submitted for fixed-laboratory analyses.

4.3.6 Design Criteria: Limits on Decision Errors

The limits on decision uncertainty or survey design criteria are specific for each PRS aggregate. Most screening assessment decisions are based on judgmental design criteria because there are no quantitative historical data that can be used in a statistical survey design. These judgmental designs are based on biasing sample locations selected by visual or geomorphic indicators to increase the probability of hitting the maximum constituent concentration in the PRS. The key assumptions of the biasing scheme are tested by collecting field quality assessment samples. These field quality assessment samples include collocated samples and samples downgradient of the expected maximum constituent concentration.

For sites where a more sophisticated approach is taken beyond the screening assessment, quantitative decision performance requirements will be developed. The assumptions behind these statistically designed sampling and analysis plans include: the spatial heterogeneity of the contamination at the site, the desired probability of detecting contamination, and the likely concentrations of COCs given the historical site information. The expected heterogeneity of the site will be summarized by a simple conceptual model of contaminant release and subsequent environmental transport. For example, historical photographs of a salvage yard show the location of equipment storage and staining that will be preferentially sampled in the RFI investigation. This information also bounds the probability of detecting stains of this size. Site-specific information used to design the sampling and analysis plans will be presented in the investigation approach and objectives subsection for each aggregate in Chapter 5, Addendum 1.

No RFI investigation is currently designed to collect data which meet the requirements of a baseline risk assessment. The development of a defensible sampling and analysis plan for risk assessment investigations requires specification of decision error tolerances. However, data obtained from an RFI investigation can be used to determine if contaminant concentration limits established by SALs have been exceeded, and if additional data collection for use in risk assessment is necessary.

4.3.7 Optimize Design: Develop a Sampling and Analysis Plan

~~The objective of~~ the last step of the DQO process is to evaluate alternative sampling and analysis plans for data collection and to select the plan that is expected to achieve the DQOs in the most cost-effective manner. For most ~~of the~~ sites ~~sampled~~ in Chapter 5, Addendum 1, a judgmental sampling-analysis plan was developed to meet the screening assessment DQOs. The sampling-analysis plan ~~for each site~~ is presented in the sample locations and methods and laboratory analyses subsection for each aggregate in Chapter 5, Addendum 1.

For a small subset of sites, some quantitative decision performance requirements were established and a statistically based sampling and analysis plan was developed. Statistical design optimization requires pertinent estimates of uncertainty, a general understanding of the underlying distribution of the ~~constituents of concern~~ COCs, and a complete set of DQOs. Professional judgment is relied upon ~~to greater or lesser extent~~ in determining where to take samples. However, even for a sampling and analysis plan where a statistical model helps select the number of samples, ~~determining which~~ analytical methods ~~are appropriate~~ for either a screening assessment or risk-based decision ~~is a process that~~ involves working with the chemists and statisticians to determine the most efficient way to generate data of acceptable quality. ~~Some of the~~ issues considered include: the sensitivity of the method compared to the SAL or other decision point, the performance of the method on LANL matrix samples, turnaround times, and ability to measure multiple constituents of potential interest at once. In most cases, the magnitude of analytical error is expected to be small compared to sampling error; however, ~~during the~~ evaluation ~~of~~ designs measurement error is evaluated to ensure that the expected performance of the method will achieve the stated DQOs.

Assuming the screening assessment yields values higher than the SALs and background for constituents of interest, these data are often valuable in evaluating alternative designs for further data collection in support of risk-based decisions. A variety of statistical survey methods appropriate for estimating means are discussed in the IWP and will be considered in future phases of data collection. In addition, future phases of the RFI will consider the impact of multiple source terms on contaminant migration and distribution.

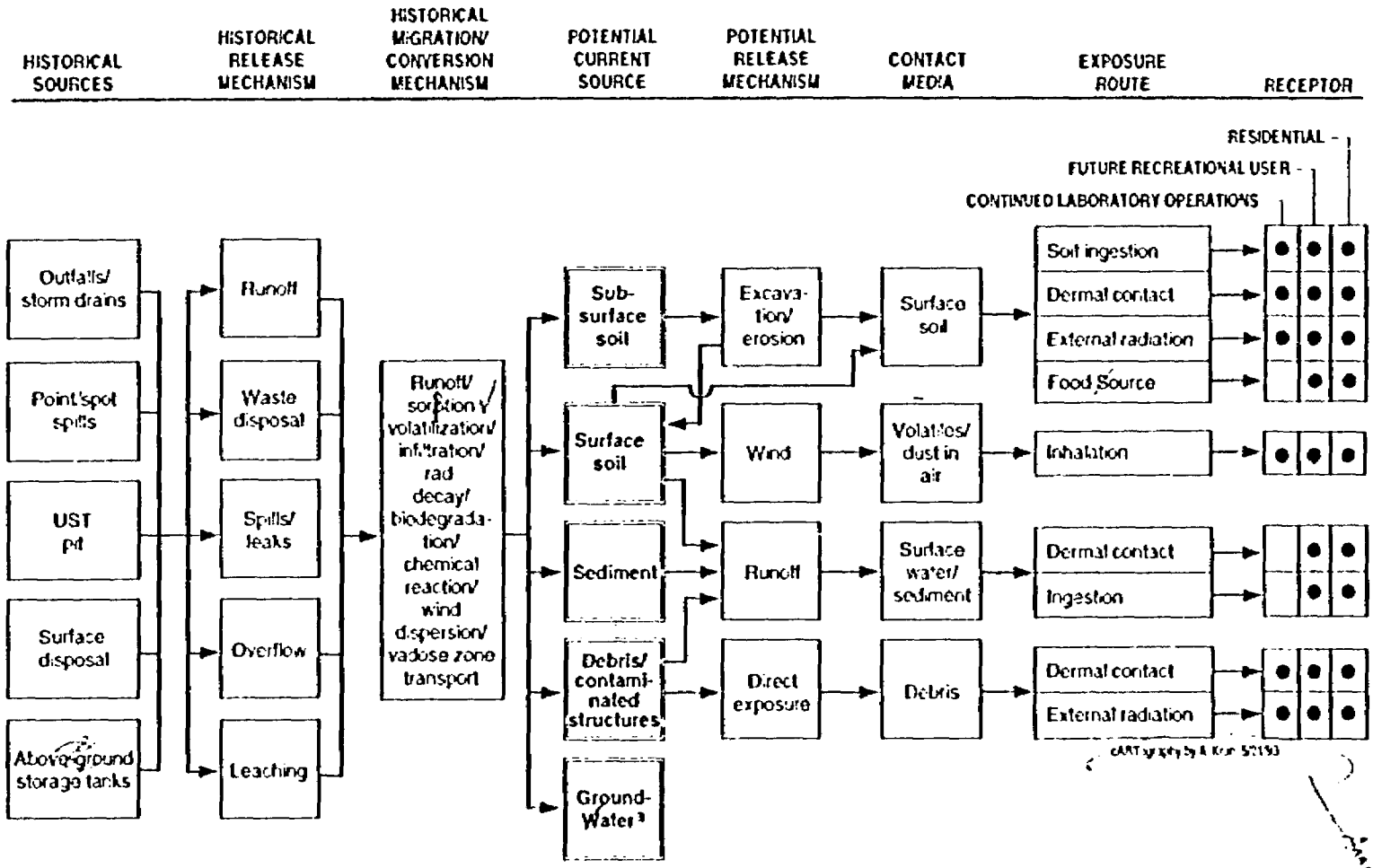
4.4 Conceptual Site Model for OU 1114

A conceptual site model was developed for each PRS aggregate to help identify the location and magnitude of sampling needed to accurately characterize the PRSs at OU 1114. The conceptual site model shown in Fig. 4-3 identifies historical sources of environmental release, migration, potential current sources of contaminants, potential release mechanisms, contact media, and exposure routes and receptors for OU 1114. Formulation of the conceptual site model for OU 1114 is based on available PRS information. Further refinement or development of separate models may be necessary based on data gathered through the RFI.

Chemicals or radionuclides at OU 1114 may have been released into the environment via drainages, outfalls, landfill areas, spills, leaks, or spattering to surface soil from storage areas, storage tanks, or surface impoundments. After contaminants have been released into the environment, they can potentially migrate via: 1) liquid infiltration into near-surface or subsurface soils that may reach groundwater via faults or surface water via seeps, 2) volatilization into ambient air, 3) wind entrainment of contaminated dust and deposition onto surface soils, and 4) surface water overflow and then runoff resulting in the contamination of sediments in drainage channels. These pathways are further described in Table 4-4.

The major environmental media that may be contacted by receptors, and the resulting potential human exposure pathways are described below.

Harvey — See if 4.4.1 will fit here. If it will, move the text & Table 4-5



[a] No apparent releases occur from perched groundwater to an exposure pathway.

Fig. 4-3. Conceptual site model for OU 1114 Addendum 5

TABLE 4-4
SUMMARY OF RELEASE PATHWAYS

PATHWAYS/MECHANISM	CONCEPT/HYPOTHESES
HISTORICAL SOURCES	• Operations/processes that contributed to the creation of the PRS (i.e., storage area, etc.)
PRS RELEASE MECHANISM	• Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, leaching, dumping, or disposing into the environment
MIGRATION PATHWAY/ CONVERSION MECHANISM	
Atmospheric dispersion	• Entrainment is limited to chemicals in surface soils
Particulate dispersion	• Entrainment and deposition are controlled by soil properties, surface roughness, vegetative cover and terrain, as well as atmospheric conditions
Volatilization	• Volatilization occurs to volatile organic compounds in surface soils, subsurface soils, and surface water
Surface water runoff	• Surface runoff is directed by natural topographic features or manmade diversions and flows toward the canyons. A topographic low can cause the water to pond on the mesa top, but in most cases the water will flow into the canyon
	• Chemical transport by surface runoff can occur in solution, sorbed to suspended sediments, or as mass movement of heavier bed sediments
	• Surface runoff may carry chemicals beyond the OU boundary
	• Contaminated surface runoff may infiltrate the canyon-bottom alluvium
Sediments	• Surface soil erosion and sediment transport is a function of runoff intensity and soil properties
	• Chemicals dispersed on the soil surface can be collected by surface water runoff and concentrated in sedimentation areas in drainages
	• Erosion of drainage channels can extend the area of contaminant dispersal in the drainage
Alluvial aquifers	• Surface runoff discharged to the canyons may infiltrate into sediments of channel alluvium
Infiltration	• Infiltration into surface soils depends on the rate of precipitation or snowmelt, antecedent soil water status, depth of soil, and soil hydraulic properties
	• Infiltration into the tuff depends on the unsaturated flow properties of the tuff
POTENTIAL RELEASE MECHANISM	
	• Joints and fractures in the tuff may provide additional pathways for infiltration to enter the subsurface regime
Leaching	• Storm water/snowmelt can dissolve chemicals from soil or other solid media, making them available for contact
	• Water solubility of chemicals and their relative affinity for soil or other solid media affects the ability of leaching to cause a release

TABLE 4-4 (CONTINUED)

SUMMARY OF RELEASE PATHWAYS

PATHWAYS/MECHANISM	CONCEPT/HYPOTHESES
	• Leaching and subsequent resorption can extend the area of contamination
Soil erosion	• The erosion of surface soils is dependent on soil properties, vegetative cover, slope and aspect, exposure to the force of the wind, and precipitation intensity and frequency
	• Depositional areas as well as erosional areas exist, and erosive loss of soil may not occur in all locations
	• Storm water runoff can mobilize soils/sediments, making them available for contact
	• Storm intensity/frequency, physical properties of soils, topography, and ground cover determine the effectiveness of erosion as a release mechanism
	• Erosion may also enlarge the contaminated area
Mass wasting	• The loss of rock from the canyon walls is a discontinuous, observable process
	• The rate of the process is extremely slow
Resuspension (wind suspension)	• Wind suspension of contaminated soil/sediment as dust makes chemicals available for contact via inhalation/ingestion
	• Physical properties of soil (e.g., silt content, moisture content), wind speed, and size of exposed ground surface determine effectiveness of wind suspension as a release mechanism
	• Wind suspension can enlarge the area of contamination and create additional exposure pathways, such as deposition on plants followed by plant consumption by humans/animals
Excavation	• Manual or mechanical movement of contaminated soil during construction, remediation, or other activities makes contaminated soil available for dermal contact, ingestion, and inhalation as dust
	• The method of excavation (i.e., type of equipment), physical properties of soil, weather conditions, and magnitude of excavation activity (i.e., depth and total area of excavation) influence the effectiveness of excavation as a release mechanism
	• Excavation can increase or decrease the size of the contaminated area, depending on how the excavated material is handled

4.4.1 Potential Human Exposure

The environmental media through which human exposure could occur include soil, air, surface water/sediment, and debris. Although contaminants could migrate to perched groundwater via faults or fractures, it does not present a potential exposure pathway because the main aquifer, at more than 800 ft deep, is the only aquifer used for domestic

water supply. It is highly unlikely that contaminants could migrate to this depth. Section 3.0 of Chapter 3 contains a discussion of the hydrology of the main aquifer beneath OU 1114 (LANL 1993, 1090). Currently, there are no groundwater wells on site.

If environmental media are found to be contaminated and SALs are exceeded, the human exposure to these contaminants will be quantified in a baseline risk assessment. Human exposure may be estimated for both current and future land use assumptions. Currently, the land within the boundaries of OU 1114 is used for Laboratory operations, two privately owned cement mixing plants (on land leased from DOE), and the privately owned Royal Crest Trailer Court (on privately owned land) located approximately 0.25 mile east of the nearest PRS (61-004) within OU 1114. Future land use could encompass recreational users and continued Laboratory operations; future residential use is possible but not as likely. Therefore, the following general land-use categories for OU 1114 have been identified: 1) continued Laboratory operations; 2) recreational land use; and 3) residential land use. Assumptions made for the three land-use scenarios are described below.

4.4.1.1 Continued Laboratory Operations Scenario

In the foreseeable future, land use is likely to be similar to current Laboratory operations. Populations of on-site workers (individuals who work on or near the site) and construction workers (individuals who would be exposed to near-surface and subsurface soils through various activities including excavation) are likely to be the reasonable maximum-exposed individuals for the continued Laboratory operations exposure scenarios.

On-site workers (e.g., maintenance workers, office workers) could be routinely exposed to contaminated media; therefore, this scenario is considered a reasonable-maximum exposure scenario for those PRSs in OU 1114 that consist of potential surface contamination (0 to 6 in.) on the mesa top. Surface contamination above SALs will be evaluated for both current and future risks in a baseline risk assessment using the on-site worker scenario. The types of PRS aggregates with potential surface contamination on the mesa top include: suface disposal, point/spot spill(s), outfalls, and storm drains.

The construction worker could be exposed to subsurface contamination during excavation activities. Once subsurface soil is excavated and brought to the surface, on-site workers could also be exposed. Therefore, PRSs in OU 1114 that consist of subsurface contamination above SALs will be evaluated in a baseline risk assessme

using the construction worker and on-site worker scenarios. The types of PRS aggregates with potential subsurface contamination include: surface disposal, storm drains, USTs, outfalls, point/spot spills, and disposal pits.

Exposure pathways relevant to workers include: 1) inhalation of fugitive dust or volatile compounds; 2) incidental ingestion of contaminated soils; 3) direct dermal contact with contaminated soils; and 4) external radiation (Table 4-5).

4.4.1.2 Recreational Scenario

The recreational scenario is a current scenario in some areas of OU 1114 and is the most probable future scenario for PRSs consisting of surface contamination (0 to 6 in.) on the canyon wall or canyon bottom. The recreational scenario may include camping, hiking, and hunting.

PRSs in OU 1114 that consist of surface contamination above SALs on canyon walls and/or canyon bottoms will be evaluated in a baseline risk assessment using the recreational scenario. PRSs that are located on the canyon wall and/or bottom are primarily outfalls. PRSs that have surface water runoff into a drainage channel or an associated outfall, will also be evaluated using the recreational scenario.

Recreational users of the area could come into contact with COPCs through ambient air, surface soil, sediments in drainage channels, and pooled surface water.

Exposure pathways associated with recreational activities include: 1) inhalation of fugitive dust; 2) soil ingestion; 3) dermal contact with soil; 4) external radiation; 5) dermal contact with surface water; ~~and~~ 6) incidental ingestion of surface water, and 7) ingestion of contaminated edible plants (piñon nuts and berries). No body of water large enough to support a consistent supply of game fish exists; therefore, exposure to contaminants by consuming contaminated fish is not a viable pathway for this site. Recreational exposure routes are further described in Table 4-6.

TABLE 4-5

SUMMARY OF EXPOSURE ROUTES IN THE CONTINUED LABORATORY OPERATIONS SCENARIO

EXPOSURE ROUTE	ASSUMPTIONS
1. Inhalation of ambient air (fugitive dust or volatiles)	• Fugitive dust is generated by soil disturbances (i.e., bulldozers, trucks, and other earth-moving equipment) during construction activities • Construction activities may expose subsurface chemicals to the surface (i.e., excavation) • There may be volatile organic compounds in near-surface and subsurface soils that would contribute to the inhalation exposure • For dust transport indoors, it can be assumed that indoor concentrations are less than those outdoors • For vapor transport indoors, concentrations indoors and outdoors can be assumed to be equivalent, except at sites where subsurface soil gases are entering indoors; in this case, vapor concentrations inside could exceed those outdoors
2. Incidental ingestion of soil	• Incidental ~~soil~~ ingestion of surface or subsurface soils may occur as a result of construction activities • Office workers would be expected to contact much less soil and dust than construction workers
3. Dermal contact with soil or debris	• Skin surface area available for contact with soil includes arms, hands, face, and head
4. External radiation	• Irradiation from radionuclides on the ground surface or debris may occur

TABLE 4-6

SUMMARY OF EXPOSURE ROUTES IN THE RECREATIONAL SCENARIO

EXPOSURE ROUTE	ASSUMPTIONS
1. Inhalation of ambient air (fugitive dust or volatiles)	• Fugitive dust is generated by the wind and during recreational activities (e.g., dirt biking) • There may be volatile constituents on site that would contribute to the inhalation exposure
2. Incidental ingestion of soil/sediment	• Incidental ~~soil/sediment~~ ingestion of surface soil or sediments may occur as a result of recreational activities (standard daily soil ingestion rates for adults and children are used)

TABLE 4-6 (CONTINUED)

SUMMARY OF EXPOSURE ROUTES IN THE RECREATIONAL SCENARIO

EXPOSURE ROUTE	ASSUMPTIONS
3. Dermal contact with soil/sediment/ debris	• Skin surface area available for contact includes arms, hands, face, legs, upper body, and head (the camping event occurs in warm weather).
4. External radiation	• Irradiation from radionuclides on the ground surface or debris may occur
5. Dermal contact with surface water	• Ephemeral streams may be present as a result of snowmelt and summer rainfall • Rainfall events result in pooled water • Standing water occurs after the rainfall event before it seeps into the ground
6. Accidental ingestion of surface water	• Ephemeral streams may be present as a result of snowmelt and summer rainfall • Rainfall events result in pooled water • Standing water occurs after the rainfall event before it seeps into the ground
7. Ingestion of produce	• Piñon nuts and wild berries growing in the canyon may have taken up contaminants from soil/runoff

4.4.1.3 Residential Scenario

The residential scenario is considered an unlikely future land-use scenario for OU 1114; however, since residential development cannot be ruled out, this potential exposure scenario must be considered. On-site residents would be exposed routinely to near-surface soils through activities such as recreation and gardening; therefore, this scenario is considered a conservative exposure scenario for those PRSs in OU 1114 that consist of potential surface contamination (0 to 6 in.) on the mesa top. Surface contamination above SALs will be evaluated for both current and future risks in a baseline risk assessment using the on-site residential scenario.

The on-site resident may also be exposed to subsurface contamination if it is brought to the surface during excavation for a home, or may be exposed to subsurface volatile contamination that migrates in vapor form into the on-site residence. Therefore, PRSs in OU 1114 that consist of subsurface contamination above SALs will be evaluated in a baseline risk assessment using the on-site residential scenario.

e potentially-applicable exposure routes for a resident are described in Table 4-7.

Harry! check Table 4-7 please to see if other work are missing. = did not [illegible]

TABLE 4-7

SUMMARY OF EXPOSURE ROUTES IN THE RESIDENTIAL SCENARIO

EXPOSURE ROUTE	ASSUMPTIONS
1. Inhalation of ambient air (fugitive dust or volatiles)	• There may be volatile organic compounds in near-surface and subsurface soils that would contribute to the inhalation exposure • For dust transport indoors, it can be assumed that indoor concentrations are less than those outdoors • For vapor transport indoors, concentrations indoors and outdoors can be assumed to be equivalent, except at sites where subsurface soil gases are entering indoors; in this case, vapor concentrations inside could exceed those outdoors
2. Incidental ingestion of soil/sediment	• Incidental soil ingestion of surface or subsurface soil may occur as a result of residenti al - activities • Children would be expected to ingest more soil and dust than adults
3. Dermal contact with soil/sediment/ debris	• Skin surface area available for contact includes arms, hands, face, legs, upper body, head, feet and legs
4. External radiation	• Irradiation from radionuclides on the ground surface or debris may occur
5. Dermal contact with surface water	• Ephemeral streams may be present as a result of snowmelt and summer rainfall • Rainfall events result in pooled water • Standing water occurs after the rainfall event before it seeps into the ground
6. Incidental ingestion of surface water	• Ephemeral streams may be present as a result of snowmelt and summer rainfall • Rainfall events result in pooled water • Standing water occurs after the rainfall event before it seeps into the ground
7. Ingestion of piñon nuts and berries	• Produce from home gardens may take up contaminants from soil/surface water • Piñon nuts and wild berries may have taken up contaminants from soil/runoff

4.5 Identification of Chemicals of Potential Concern

The first step in evaluating risks at a site is to identify the COPCs. COPCs are defined as those chemicals present within OU 1114 resulting from current or past activities that are

detected above reportable levels or at concentrations above naturally occurring levels and that have been determined not to be sampling or laboratory artifacts.

The objectives of the Phase I sampling activity, or screening assessment, are to accomplish the following:

1. Confirm the presence or absence of anticipated COPCs from known site activities;

2. Use broad-spectrum analytical methods that will allow for a reasonable determination that additional COPCs are not present (e.g., the evaluation of tentatively identified compounds from mass spectral scans);

3. Select analytical methods primarily on the basis of sensitivity for anticipated COPCs at their SALs and secondarily for broad-band spectrum capability; and,

4. Estimate if the concentration of each COPC is greater than some method threshold.

Chemical constituents that are essential human nutrients such as potassium and magnesium, may also be screened if they are present at concentrations that are not toxic (EPA 1989, 0305).

The main classes of COPCs identified for OU 1114 are ~~volatile organic compounds~~ (VOCs), semivolatile organic compounds (SVOCs), metals, and radionuclides. These categories correspond to a method of analysis used to quantify their presence in samples. Section 7.0 of Appendix D, Sampling Methods, lists the LANL ER standard operating procedures used for these standard suites of chemicals. Types of VOCs found at OU 1114 include solvents and chemicals used in laboratory projects. SVOCs that may be found at OU 1114 include PCBs used in transformers. Pesticides and herbicides were also stored, handled, or applied at specific locations. These substances are measured by specific analytical suites.

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EDITING WORKSHEET

Acronym or Hyphenation List

A ITOC 1 ALARA 16	B	C COPCs 13 CRGA 14 (Table 4-3) COCs 16 CMS 16
D DA 1 DOE's 1 DQO 1	E ER 1 EPA 1 EQS 15 ← EC 15	F FIMAD 16
G	H	I IWP 1
J	K	L LANL 1
M	N NFA 1 NMED 1	O OU 1
P PESS 1 PCBs 16	Q	R RCRA 1 RFI 1 RESRAD 16
S SUMU 1 SAFER 1 SAL 15 (Table 4-3) SAL 16 (text) SVOCs 3	T	U
V VCA 15 VOCs 16	W	XYZ

Replaced by Chapter 4 dated 6-23-95

4.0 TECHNICAL APPROACH

4.1 Aggregation of Potential Release Sites (PRSs)

The potential release sites (PRSs) to be evaluated in this Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) work plan were aggregated for Operable Unit (OU) 1114 by proximity, physical similarity, and similarity of historical use. Chapter 5 in the RFI Work Plan for OU 1114 covered 10 aggregates composed of 53 PRSs (LANL 1993, 1090). Chapter 5 in Addendum 1 to the RFI Work Plan for OU 1114 covers 16 aggregates composed of 25 PRSs. Table 4-1 lists aggregates in Chapter 5 of Addendum 1, the PRS numbers, and generic strategies used for aggregation. The first digit(s) of the solid waste management unit (SWMU) or area of concern (AOC) number identifies the technical area in which it is located. Table 4-2 lists PRSs discussed in Chapter 6 of Addendum 1 that are candidates for no further action (NFA) or deferred action (DA), including criteria used for these decisions. An NFA decision that is based on absence of human health risk does not imply that ecological risks do not exist. Ecological risk assessment process is described in Subsection 4.5.

4.2 Site Characterization Decision Model

This work plan adheres to the Laboratory's Environmental Restoration (ER) Project technical approach for data collection and evaluation as documented in Chapter 4 of the Installation Work Plan (IWP) (LANL 1993, 1017). This technical approach is an efficient, defensible, and effective method of data collection for support of environmental decision making. The Laboratory's approach is an adaptation of the Department of Energy's (DOE) streamlined approach for environmental restoration (SAFER) which combines elements of the data quality objectives (DQO) process (Chapter 4 of the IWP) and the observational approach (Appendix G of the IWP) (LANL 1993, 1017). At Los Alamos National Laboratory (LANL), these tools are applied within the framework of a project-wide decision flow (Fig. 4-1) which uses human health and environmental risk as the basis for site-specific decision making.

Ans: Please check against changes in the 1994 IWP

Ans: Please check against changes in the 1994 IWP

Ans: No Appendix G in the 1994 IWP

TABLE 4-1

AGGREGATES IN CHAPTER 5, ADDENDUM 1

SWMU OR AOC NUMBER	AGGREGATE DESCRIPTION	SUBSECTION	BASIS OF AGGREGATION	NUMBER OF PRSs IN AGGREGATE
3-054(e), C-3-006	Outfall	5.12	C-3-006 is source to 3-054(e)	2
3-049(a)	Outfall	5.13	NA	1
3-021	Outfall	5.14	NA	1
3-052(b), 3-056(k)	Storm drain and storage area	5.15	3-056(k) is source to 3-052(b)	2
3-054(b), 3-052(a,e)	Outfall	5.16	3-052(a,e) are sources to 3-054(b)	3
3-001(e)	Storage area	5.17	NA	1
3-051(c) 3-056(l)	Vacuum pump exhaust stains	5.18	Proximity	2
3-049(b), C-3-014	Outlet discharge area and equipment storage area	5.19	Proximity	2
3-047(d)	Storage area	5.20	NA	1
3-003(p)	Storage area	5.21	NA	1
3-059 3-003(n)	Salvage yard	5.22	Proximity	2
3-029(b), 3-036(b), C-3-016	Storage area, tanks, and landfill	5.23	Related to the Asphalt Batch Plant	4
3-034(a)	Radioactive waste tanks	5.24	NA	1
3-007	Firing site	5.25	NA	1
3-004(c,d)	Dumpster areas	5.26, 27, 28, 29, 30	Similarity	2
C-3-053	Duplicate of SWMU 3-015	5.27	NA	1
3-052(f)	Duplicate of SWMUs 3-013(a,b)	5.28	NA	1
C-3-042	Duplicate of SWMU 3-003(a)	5.29	NA	1
3-045(b,c)	Duplicates of SWMU 3-012(b)	5.30	Proximity	2

TABLE 4-2

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION[a] IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
NO	3-001(d)	TA-3-170	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(f)	TA-3-038	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(g)	TA-3-473	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(h)	TA-3-066	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(j)	TA-3-034	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(l)	TA-3-316	Storage area	6.4.1.3	1	No RCRA or hazardous wastes/substances
NO	3-001(n)	TA-3-032	Satellite accumulation	6.4.1.3	3	Approved accumulation area
NO	3-001(o)	TA-3-035	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(q)	TA-3-043	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(s)	TA-3-494	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(t)	TA-3-502	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(u)	TA-3-1485	Satellite accumulation	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	3-001(v)	TA-3-1486	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(w)	TA-3-1888	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(x)	TA-3-022	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(y)	TA-3-029	Satellite accumulation	6.4.3.5	3	Approved accumulation area
YES	3-002(a)	TA-3-066	Satellite accumulation	6.4.3.5	3	Approved accumulation area
YES	3-002(d)	TA-3-040	Drum storage	6.4.2.3	2	No release to environment
NO	3-003(d)	TA-3-141	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority

TABLE 4-2 (Continued)

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	—	RATIONALE
NO	3-003(e)	TA-3-029	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(f)	TA-3-066	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(g)	TA-3-035	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(h)	TA-3-039	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(i)	TA-3-032	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(j)	TA-3-040	PCB-containing capacitors, transformers, drums	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(k)	TA-3-316	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(l)	TA-3-016	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(m)	TA-3-022	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority

TABLE 4-2 (Continued)

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	—	RATIONALE
NO	3-003(o)	TA-3-287	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-004(a)	TA-3-029	Drum storage/ temporary	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-004(b)	TA-3-029	Drum storage	6.4.1.2	1	No RCRA or hazardous wastes/substances
NO	3-004(e)	TA-3-029	Satellite accumulation	6.4.1.2	1	No RCRA or hazardous wastes/substances
NO	3-004(f)	TA-3-029	Satellite accumulation	6.4.1.2	1	No RCRA or hazardous wastes/substances
NO	3-005		Renumbered; addressed in 1993 RFI Work Plan	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	3-006(a)	TA-3-012	HE-associated	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	3-008(a)	Old TA-3	HE-associated	6.4.1.3	1	No RCRA or hazardous wastes/substances
NO	3-008(b)	TA-3-43	HE-associated	6.4.2.5	2	No release to environment
YES	3-009(i)	TA-3-170	Debris pile	6.4.1.1	1	No RCRA or hazardous wastes/substances
YES	3-009(j)	TA-3-142	Debris pile	6.4.1.1	1	No RCRA or hazardous wastes/substances
YES	3-011	TA-3-031 TA-3-101	Outfall	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-016(a)	TA-3-130 TA-3-1484	Septic tank & seepage pit	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-016(b)	TA-3-272	Septic tank	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-016(c)	TA-3-079	Septic tank	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-016(d)	TA-3-443	Septic pit	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-016(e)	TA-3-1639	Lift station	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	3-016(f)	TA-3-1617	Septic pit	6.4.1.4	1	No RCRA or hazardous wastes/substances

TABLE 4-2 (Continued)

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	—	RATIONALE
YES	3-019	TA-3-016 TA-3-015	Septic tank	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-022	TA-3-316	Sump	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-023	TA-3-105 TA-3-148	Sump pit	6.4.2.4	2	No release to environment
YES	3-024	TA-3-141 TA-3-174	Pump pit	6.4.2.4	2	No release to environment
YES	3-025(a)	TA-3-034	Oil trap sump	6.4.1.3	1	No RCRA or hazardous wastes/substances
YES	3-025(b)	TA-3-102	Oil trap	6.4.2.1	2	No release to environment
NO	3-025(c)	TA-3-039	Sump	6.4.2.1	2	No release to environment
YES	3-026(b)	TA-3-132	Sump	6.4.1.1	2	No release to environment
YES	3-026(c)	TA-3-029	Sump	6.4.2.1	2	No release to environment
NO	3-027	TA-3-036	Sump/lift wells	6.4.2.5	4	No threat-characterized/ remediated
NO	3-030	TA-3-066	Temporary pit; addressed in RFI Work Plan	6.4.1.4	1	No RCRA or hazardous wastes/substances
YES	3-031	TA-3-029	Sump	6.4.5	2	No release to environment
YES	3-032	TA-3-038	Aboveground storage tank	6.4.2.4	2	No release to environment
YES	3-034(b)	TA-3-141	Contaminated soil	6.4.2.1	2	No release to environment
NO	3-036(f)	TA-3-070	Aboveground storage tank	6.4.2.2	2	No release to environment
NO	3-036(g)	TA-3-022	Aboveground storage tank	6.4.3.2	3	Site regulated or closed under different authority
NO	3-036(h)	TA-3-022	Aboveground storage tank	6.4.2.4	2	No release to environment
NO	3-036(i)	TA-3-022	Aboveground storage tank	6.4.4.2	4	No threat-characterized/ remediated
NO	3-036(j)	TA-3-022	Aboveground storage tank	6.4.3.2	3	Site regulated or closed by different authority
NO	3-038(c)	TA-3-028	Industrial waste line left in place	6.4.3.4	3	Site regulated or closed by different authority

TABLE 4-2 (Continued)

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
NO	3-038(e)	TA-3-065	Sink drains	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-038(f)	TA-3-1502	Industrial waste line left in place	6.4.5	DA	Active; no pathway to environment
NO	3-040(a)	TA-3-030	Photographic film	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-040(b)	TA-3-043	Photographic film	6.4.2.5	2	No release to environment
NO	3-041	TA-3-066	Holding tank	6.4.2.1	2	No release to environment
NO	3-043(a)	TA-3-070	Storage tank	6.4.2.2	2	No release to environment
NO	3-043(b)	TA-3-070	Storage tank	6.4.2.2	2	No release to environment
YES	3-043(c)	TA-3-040 TA-3-718	Storage tank	6.4.4.2	4	No threat-characterized/ remediated
NO	3-043(d)	TA-3-070	Aboveground storage tank	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	3-043(f)	TA-3-070	Storage tank	6.4.2.2	3	Site regulated or closed under different authority
NO	3-043(g)	TA-3-070	Storage tank	6.4.4.2	4	No threat-characterized/ remediated
NO	3-043(h)	TA-3-070	Aboveground storage tank	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	3-043(i)	TA-3-040 TA-3-93	Storage tank	6.4.3.1	3	Site regulated or closed under different authority
NO	3-044(a)	TA-3-70	Storage area	6.4.2.2	2	No release to environment
YES	3-045(a)	TA-3-022	Outfall	6.4.3.4	3	Site regulated or closed under different authority
YES	3-045(d)	TA-3-022	Aboveground storage tank	6.4.1.4	1	No RCRA or hazardous wastes/substances
YES	3-045(e)	TA-3-057	Outfall	6.4.1.1	1	No RCRA or hazardous wastes/substances
YES	3-045(f)	TA-3-223	Outfall from drain	6.4.1.1	1	No RCRA or hazardous wastes/substances
YES	3-045(g)	TA-3-073	Outfall	6.4.3.4	3	Site regulated or closed under different authority
YES	3-045(h)	TA-3-066 TA-3-187	Outfall	6.4.3.4	3	Site regulated or closed under different authority
YES	3-045(i)	TA-3-034	Outfall	6.4.1.1	1	No RCRA or hazardous wastes/substances

TABLE 4-2 (Continued)

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	—	RATIONALE
YES	3-046	TA-3-022	Aboveground storage tank	6.4.3.2	3	Site regulated or closed under different authority
NO	3-047(a)	TA-3-236	Storage	6.4.1.3	1	No RCRA or hazardous wastes/substances
NO	3-047(b)	TA-3-070	Storage	6.4.2.2	2	No release to environment
NO	3-047(c)	TA-3-070	Drum storage	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-047(e)	TA-3-1963	Storage	6.4.2.2	2	No release to environment
NO	3-047(f)	TA-3-070	Storage	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-047(g)	TA-3-141	Drum storage	6.4.2.3	2	No release to environment
NO	3-047(h)	TA-3-170	Waste oil leaks, spills	6.4.2.3	2	No release to environment
NO	3-047(i)	TA-3-216	Satellite accumulation	6.4.2.5	2	No release to environment
NO	3-047(j)	TA-3-016	Drum storage	6.4.4.1.4	4	No threat-characterized/ remediated
NO	3-047(k)	TA-3-374	Drum storage	6.4.1.1	4	No threat-characterized/ remediated
NO	3-048	TA-3-029	Satellite accumulation	6.4.1.2	1	No RCRA or hazardous wastes/substances
YES	3-049(c)	TA-3-066	Outfall	6.4.3.4	3	Site regulated or closed by different authority
YES	3-049(d)	TA-3-066	Outfall	6.4.3.4	3	Site regulated or closed by different authority
YES	3-049(e)	TA-3-066	Outfall	6.4.1.4	1	No RCRA or hazardous wastes/substances
YES	3-050(a)	TA-3-029	Exhaust emissions	6.4.1.2	1	No RCRA or hazardous wastes/substances
YES	3-050(b)	TA-3-034	Exhaust emissions	6.4.1.2	1	No RCRA or hazardous wastes/substances
YES	3-050(c)	TA-3-35	Exhaust emissions	6.4.1.2	1	No RCRA or hazardous wastes/substances
YES	3-050(d)	TA-3-102	Exhaust emissions	6.4.1.2	1	No RCRA or hazardous wastes/substances
YES	3-050(e)	TA-3-39	Exhaust emissions	6.4.1.2	1	No RCRA or hazardous wastes/substances
YES	3-050(f)	TA-3-40	Exhaust emissions	6.4.1.2	1	No RCRA or hazardous wastes/substances

TABLE 4-2 (Continued)

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
YES	3-050(g)	TA-3-16	Exhaust emissions	6.4.1.2	1	No RCRA or hazardous wastes/substances
NO	3-051(a)	TA-3-039	Oil from leaking compressor	6.4.3.3	3	Site regulated or closed by different authority
NO	3-051(b)	TA-3-102	Oil/leaking compressor	6.4.3.3	3	Site regulated or closed by different authority
NO	3-051(d)	TA-3-040	Oil/leaking compressor	6.4.1.1	1	No RCRA or hazardous wastes/substances
YES	3-052(c)	TA-3-422	Storm drains	6.4.4.1	4	One-time release
NO	3-052(d)	TA-3-287	Storm drains	6.4.3.3	3	Site regulated or closed by different authority
YES	3-054(a)	TA-3-016 TA-3-019	Outfall	6.4.3.4	3	Site regulated or closed by different authority
YES	3-054(c)	TA-3-105 TA-3-156	Outfall	6.4.3.4	3	Site regulated or closed by different authority
YES	3-054(d)	TA-3-016 TA-3-208	Outfall	6.4.3.4	3	Site regulated or closed by different authority
YES	3-055(a)	TA-3-016	Outfall	6.4.1.1	1	No RCRA or hazardous wastes/substances
YES	3-055(c)	TA-3-041	Outfall	6.4.1.3	1	No RCRA or hazardous wastes/substances
YES	3-055(d)	TA-3-059	Outfall	6.4.1.3	1	No RCRA or hazardous wastes/substances
NO	3-056(b)	TA-3-70	Storage area	6.4.2.2	2	No release to environment
YES	3-056(d)	TA-3-047	Drum storage	6.4.2.3	2	No release to environment
NO	3-056(e)	TA-3-34	Satellite storage	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	3-056(f)	TA-3-316	Drum storage	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	3-056(g)	TA-3-016	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-056(h)	TA-3-105 TA-3-287	PCB-containing capacitors and transformers	6.4.3.3	4	No threat-characterized/ remediated
NO	3-056(i)	TA-3-038	Drum storage	6.4.2.3	2	No release to environment
NO	3-056(j)	TA-3-473	Storage	6.4.1.1	1	No RCRA or hazardous wastes/substances

TABLE 4-2 (Continued)

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
YES	3-056(m)	TA-3-322	Drum storage	6.4.1.1	1	No RCRA or hazardous wastes/substances
YES	3-056(n)	TA-3-379	Drum storage	6.4.2.3	2	No release to environment
NO	3-057	TA-3-100 TA-3-688	Grease trap	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	3-058	TA-3-029	Satellite accumulation	6.4.1.2	1	No RCRA or hazardous wastes/substances
NO	C-3-001	TA-3-28 TA-3-1872	Gas trap	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	C-3-002	TA-3-035	Leak from asphalt machine	6.4.4.1	4	One-time release
NO	C-3-003	TA-3-039	Stained asphalt	6.4.4.1	4	One-time release
NO	C-3-004	TA-3-066	Misc. debris	6.4.1.1	1	No RCRA or hazardous wastes/substances
NO	C-3-005	TA-3-073	Storm drains	6.4.4.1	4	No threat-characterized/ remediated
NO	C-3-007	TA-3-035	Storage	6.4.1.2	1	No RCRA or hazardous wastes/substances
NO	C-3-008	TA-3-164	Storage/rad contaminated	6.4.1.2	1	No RCRA or hazardous wastes/substances
NO	C-3-009	TA-3-169	Storage	6.4.2.5	2	No release to environment
NO	C-3-010	TA-3-019	Outfall	6.4.2.5	2	No release to environment
NO	C-3-011	TA-3-070	Storage tank	6.4.2.2	2	No release to environment
NO	C-3-012	TA-3-029	Satellite accumulation	6.4.2.5	1	No RCRA or hazardous wastes/substances
NO	C-3-015	TA-3-036	Underground storage tank	6.4.3.1	3	Site regulated or closed under different authority
NO	C-3-017	TA-3-028	Underground storage tank	6.4.3.1	3	Site regulated or closed under different authority
NO	C-3-018	~~TA-3-028~~ TA-3-157	~~Underground~~ storage tank	6.4.3.2	3	Site regulated or closed under different authority
NO	C-3-019	TA-3-016	Underground storage tank	6.4.1.3	1	No RCRA or hazardous wastes/substances
NO	C-3-021	TA-3-016 TA-3-191	Underground storage tank	6.4.3.1	3	Site regulated or closed under different authority

UST is actually aboveground - was in TA-3-157

TABLE 4-2 (Continued)

PRSs PROPOSED FOR NO FURTHER ACTION

OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	—	RATIONALE
NO	C-3-022	TA-3-070	Kerosene tanker trailer	6.4.2.2	2	No release to environment
NO	C-59-001	TA-59-184	PCB-containing capacitors and transformers	6.4.3.3	3	Site regulated or closed under different authority
NO	C-3-020	TA-3-105	Storage tanks	6.4.3.1	3	Site regulated or closed under different authority
NO	C-60-001	TA-60-1 TA-3-382	Storage tank	6.4.3.1	3	Site regulated or closed under different authority
NO	C-60-002	TA-60-45	Storage tank	6.4.3.1	3	Site regulated or closed under different authority
NO	C-60-003	TA-60-29	One-time release at pest shed	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	C-60-004	TA-60-1	Storage tank	6.4.1.4	1	No RCRA or hazardous wastes/substances
NO	C-61-001	TA-61-23	PCB oil leak	6.4.1.4	1	No RCRA or hazardous wastes/substances

[a]Environmental Restoration Project 1995, 1173.

In this approach, investigations are phased to address decisions in a sequential manner, where each decision brings the efforts at OU 1114 closer to the ultimate goal of selecting and implementing an appropriate corrective action. The LANL ER Project decision sequence (Fig. 4-1) is applied, along with a series of corresponding technical assumptions, to each decision. The decision flow translates each phase of the RCRA corrective action process into an operational sequence of questions (i.e., it addresses each phase of the corrective action process by identifying one or more decisions that can be made based on the collection and evaluation of defensible data sets). The decision flow and technical assumptions were formally discussed and approved by a task force consisting of senior representatives from DOE, the Environmental Protection Agency (EPA), Region 6, New Mexico Environment Department (NMED), LANL, and Sandia National Laboratory.

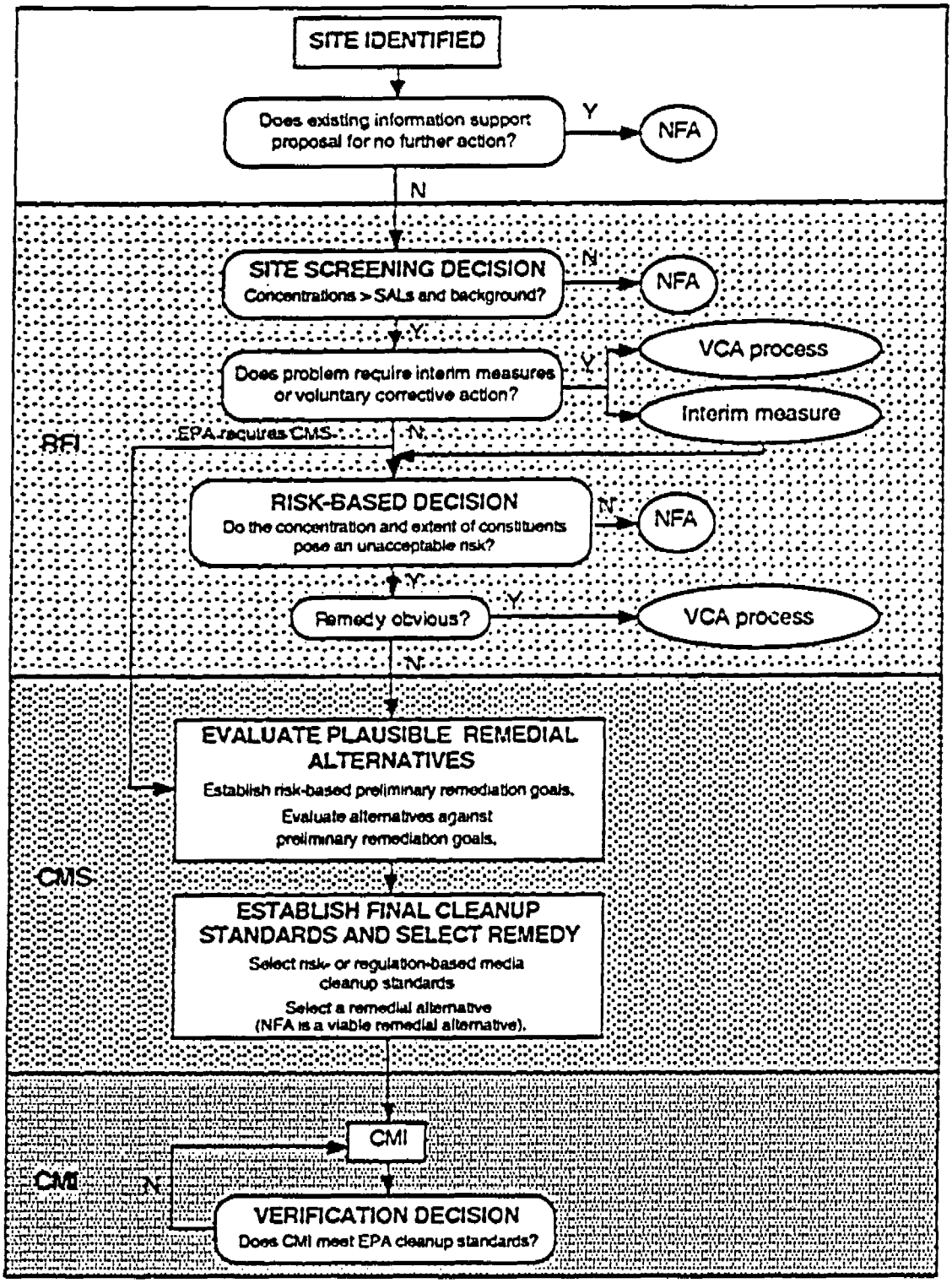


Fig. 4-1 Framework for project-wide decision flow.

4.3 Sitewide Investigation Approach

DQOs are requirements that specify the quality of data collected during the RFI. The formal DQO planning approach developed by EPA consists of seven steps, which include: 1) state the problem, 2) identify the decision, 3) identify inputs to the decision, 4) define the study boundaries, 5) develop a decision rule, 6) specify limits on decision uncertainty, and 7) optimize the design for collecting data. The sampling and analysis plans for most PRSs are based on the screening assessment decision in which DQO inputs are prespecified; therefore, a formal DQO process is not followed for these PRSs. The prespecified generic DQO inputs for screening assessment decisions are presented below, along with the description of the approach used to specify DQOs for all PRSs in Chapter 5, Addendum 1.

Run-in text

4.3.1 State the Problem

The purpose of the first step of the DQO process is to summarize what is known about the potential contamination problem at each PRS. Archival information is compiled and evaluated and field reconnaissance visits are made to formulate a conceptual mode. This information is summarized in the description and history subsection for each aggregate in Chapter 5, Addendum 1. These historical data help develop a list of potential ~~contaminants of~~ concern (PCOCs), summarized in Table 4-3, and a conceptual exposure model for each aggregate, which is discussed in Subsection 4.4 of this chapter.

4.3.2 Identify the Decision

After the description and history have been documented, the next step in the DQO process is to identify the decision to be made. The planning team determines where each PRS in the RCRA decision sequence falls (Fig. 4-1). As noted above, PRSs are sampled to evaluate the site screening or screening assessment decision (Fig. 4-2). The generic screening assessment decision statement objective is to determine if there has there been a release at the PRS where the environmental concentration exceeds conservative screening levels.

TABLE 4-3

BACKGROUND AND SCREENING ACTION LEVELS FOR REGULATED SUBSTANCES AT OU 1114

chemicals of

POTENTIAL CONTAMINANTS OF CONCERN	CRQL[a] (mg/kg)	UPPER TOLERANCE LIMITS FOR LANL SOIL BACKGROUND (mg/kg)	SCREENING ACTION LEVEL IN SOIL (mg/kg)
Metals			
Antimony	12[b]	NA[c]	32
Arsenic	2	11.6	d
Barium	40	1 140	5 600
Beryllium	1[b]	3.31	d
Cadmium	1	NA	80
Chromium III	2	NA	80 000
Chromium VI	2	NA	400
Cyanide	2	0	1 600
Lead	0.6	39	400[e]
Mercury	0.04	NA	24
Nickel	8	26.7	1 600
Silver	2	NA	400
Uranium (natural)	NA	NA	66
Volatile organic compounds			
Acetone	0.01	0	8 000
Benzene	0.01[b]	0	0.67
Ethylbenzene	0.01	0	3 100
Toluene	0.01	0	910
Trichloroethene	0.01	0	3.2
1,1,1-Trichloroethane	0.01	0	1 000
1,1,2-Trichloroethane	0.01	0	6.3
Xylene	0.01	0	16 000
Semivolatile organic compounds			
Benzo(a)pyrene	0.33[b]	0	0.10
Herbicides	f	NA	ISALS
PCBs	f	0	0.09
Pesticides	f	NA	ISALS
Phenol	0.33	0	48 000
Radionuclides (pCi/g)	CRQL (pCi/gm)	REGIONAL BACKGROUND (pCi/gm)	SCREENING ACTION LEVEL (pCi/gm)
Cesium-137	Not required	0.43 /64[h]	4[i]
Plutonium-238	Not required	0.001/76[h]	20[i]
Plutonium-239	Not required	0.007/76[h]	18[i]
Tritium	Not required	0.98/43[h,j]	810[i]
Uranium-235	Not required	NA	18[i]

a Contract-required quantitation limits (CRQLs) for soil [Appendix J of IWP (LANL 1993, 1017)].

b The SAL is less than the CRQL; therefore, special analytical services may be required.

c NA = Not available

d Background comparison should be performed for this compound to determine if further action is required

e Soil screening action level (SAL) based on EPA OSWER Directive 9355.4-12, "Revised Interim Guidance on Establishing Lead Cleanup Levels at Superfund Sites," (EPA 1994, ~~17-1013~~). 1209

f CRQL available for individual analytes within group listed.

g ISAL = Individual SAL not available for contaminant group listed.

h Purtymun et al. 1987, 0211

i Determined by Laboratory risk assessment committee

j Assuming 10% soil moisture

For certain PRSs historical information is adequate to identify potential contaminants and estimate the volume of contaminated media. For these PRSs, it is more efficient to collect sufficient data to either conduct a voluntary corrective action (VCA) or to conduct the RFI Phase I and Phase II investigations within a single field mobilization. Such exceptions to the generic screening assessment decision statement will be documented in the investigation approach and objectives subsection for each aggregate in Chapter 5, Addendum 1.

? Aren't we no longer have VCAs, only ECs. Is that correct ?

4.3.3 Identify Decision Inputs

After specifying the decision to be made, the next step of the DQO process involves identifying the inputs to the decision. The objective is to identify all informational inputs ~~that will be~~ required to resolve the decision [including, when possible, the screening action level(s)] and to list all the environmental variables or characteristics that need to be measured to provide the ~~type of~~ information needed to make the decision. The generic screening assessment decision input states that the decision inputs include the screening action

levels or background levels for each potential contaminant. In cases where screening action levels are not available, they will be calculated.

In some cases the PRS archival data ~~is~~ are adequate to focus the investigation on a particular set of contaminants. For example, at capacitor storage sites a defensible approach may be to focus the study on polychlorinated biphenyls (PCBs) alone. If the historical data are uncertain, a complete analyte suite may be needed to determine the list of constituents of concern (COCs). If fewer analytes than the standard list of RCRA analytes are being analyzed at a PRS, then the information supporting a reduced analyte suite will be included in the investigation approach and objectives subsection for each aggregate in Chapter 5, Addendum 1.

Alison Dorrier said there are still COCs but not PCOCs. PCOCs are COPCs.

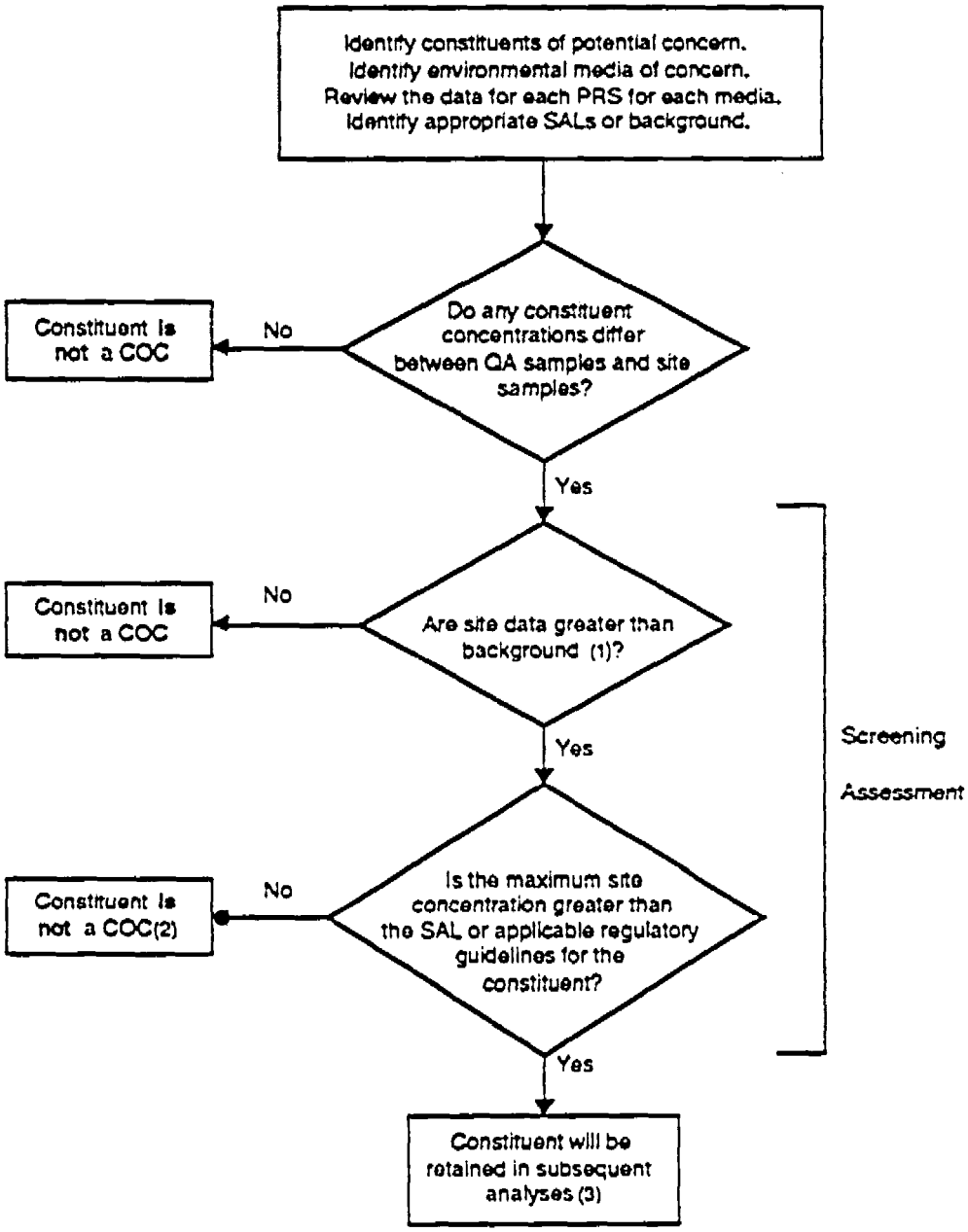
4.3.4 Define the Study Boundaries

The generic screening assessment decision boundary states that the spatial domain is the boundaries of the PRS as defined in the FIMAD database. Samples submitted for laboratory analysis will be collected from the portion of the soil (or bedrock) horizon that is most likely to contain ~~PCOCs~~ COPCs. For example, samples collected for volatile organic chemicals will be from deep surface corings (greater than six inches depth). Temporal variation is not an issue for sampling of any PRS. This generic statement applies to all PRSs in Chapter 5, Addendum 1. The rationale for PRS-specific soil sampling depths is presented in Subsection 5.0, and in and the investigation approach and objectives subsection for each aggregate in Chapter 5, Addendum 1.

4.3.5 Decision Logic

The main goal of the screening assessment is to determine if there are any COCs in site media (Fig. 4-2). The generic screening assessment decision rule statement declares: if the maximum concentration of all hazardous constituent concentrations ~~are~~ is below the screening action levels (SALs) or background concentrations, then propose no further action for this PRS. Before proposing NFA for a site, the data will be reviewed for multiple constituents that are marginally less than the SAL. If any hazardous constituent concentration is greater than the SAL or background concentrations, then either conduct a Phase II RFI investigation, a VCA, or proceed to a corrective measures study (CMS) for this PRS. The selection of

Explain acronym at first use.



(1) Inorganics are compared to LANL background concentrations, and organics are compared to the ATSDR/Bradley urban background concentrations.

(2) Site data will be reviewed for multiple constituents that are less than the SAL and are above background.

(3) RFI Phase II data collection or risk assessment

Fig. 4-2. Screening assessment flow chart.

Phase II, VCA, or CMS will be made based on the ability to conduct a baseline risk assessment with Phase I data and the availability of an obvious remedy for the site. Decision rules for sites where screening assessment is not planned will be presented in the investigation approach and objectives subsection for each aggregate in Chapter 5, Addendum 1.

SALs are media-specific, risk-based concentration levels for potential contaminants derived using conservative criteria. The motivation for developing SALs is to have a tool for effective discrimination between problem and non-problem sites so that resources are used effectively. SALs for the primary ~~PCOCs~~ COPCs at OU 1114 are provided in Table 4-3. In most cases, SALs for non-radiological constituents are based on the methodology in Proposed Subpart S of RCRA to calculate action levels (EPA 1990, 0432). Radiological SALs are based on a 10 mrem per year dose using a conservative residential-use exposure scenario. SALs for radionuclides can be derived using the residual radioactive material (RESRAD) model that has been developed for the DOE (Yu et al. 1993, 1014). However, if a regulatory standard exists and is lower than the value derived by these methods, this lower value will be used for the SAL. The derivation of SALs and their values is discussed in Appendix J of the IWP (LANL, 1993, 1017).

Comparisons to background will be made for constituents where the LANL background concentration is greater than the SAL. Constituents where the SAL is lower than LANL background include arsenic and beryllium. Statistical comparisons of site data to LANL background data will be made to determine if site data are significantly greater than background. Two types of comparisons will be made. One comparison will determine if site data tend to be greater than appropriate background data and the second comparison will determine if there any individual site values are significantly greater than the upper limit of background. The appropriate background data will be defined by the sample soil horizon and the iron concentration in the PRS soil sample data. Iron has been found to be strongly correlated to arsenic and beryllium concentrations in LANL background soils (Longmire et al. 1993, 0958).

It is important to note that PRS decisions beyond the screening assessment will not be made based on the maximum observed value. SALs are not cleanup levels; cleanup levels will be based on site-specific risk evaluations

and as low as reasonably achievable (ALARA) criteria. Risk assessment is typically based on the 95% upper confidence limit of the average concentration. The LANL approach adopts the Superfund risk assessment guidance (EPA 1991, 0746) for chemical constituents and DOE's RESRAD model (Yu et al. 1993, 1014). In both cases the average concentration within appropriate exposure units (EUs) should be used as input to the decision.

If the site investigation results in a determination that remediation is necessary, the remediation alternatives selected must achieve acceptable risk levels. Choices between alternatives that meet the human health risk requirements will be based on additional factors such as ecological impact, cost, socioeconomic impacts, public/community input, regulatory concerns (in addition to risk), and impact on Laboratory operations (Appendix I of the IWP) (LANL 1993, 1017). Note that all actions refer to potential or known surface and subsurface soil problems. There is no indication that other media are contaminated, which might require other technologies (e.g., steam injection for vadose zone contaminants).

A PRS may be proposed for NFA if: 1) no COCs are known or found to be present at concentrations above SALs or background (whichever is appropriate) based on historical data or Phase I sampling; 2) releases of COCs are judged not to have taken place and are unlikely to take place in the future; or, 3) some other regulatory program takes precedence. NFA designations are possible at any point in the remedial process. Chapter 6, Section 6.0 briefly presents the basis for NFA and DA decisions for PRSs in this work plan. The PRSs addressed by these criteria are listed in Table 4-2. Appendix I, Subsection 4.1 of the IWP presents a detailed discussion of the rationale for NFA or DA based on archival information (LANL 1993, 1017).

During the development of this RFI work plan, VCAs will be undertaken when necessary to protect the health and safety of the public and Laboratory personnel, when waste site conditions are such that a VCA is an appropriate response to stop further migration or dispersion of contaminants into the environment, or when cost-effective. In units of limited area where hazardous constituents are known or suspected, corrective action (e.g., removal of soil into 55-gal. drums) will be initiated, guided by field screening to the point where regulatory cleanup is accomplished. After the corrective action is

complete, confirmatory samples will be submitted for fixed-laboratory analyses.

4.3.6 Design Criteria: Limits on Decision Errors

The limits on decision uncertainty or survey design criteria are specific for each PRS aggregate. Most screening assessment decisions are based on judgmental design criteria because there are no quantitative historical data that can be used in a statistical survey design. These judgmental designs are based on biasing sample locations selected by visual or geomorphic indicators to increase the probability of hitting the maximum constituent concentration in the PRS. The key assumptions of the biasing scheme are tested by collecting field quality assessment samples. These field quality assessment samples include collocated samples and samples downgradient of the expected maximum constituent concentration.

For sites where a more sophisticated approach is taken beyond the screening assessment, quantitative decision performance requirements will be developed. The assumptions behind these statistically designed sampling and analysis plans include: the spatial heterogeneity of the contamination at the site, the desired probability of detecting contamination, and the likely concentrations of COCs given the historical site information. The expected heterogeneity of the site will be summarized by a simple conceptual model of contaminant release and subsequent environmental transport. For example, historical photographs of a salvage yard show the location of equipment storage and staining that will be preferentially sampled in the RFI investigation. This information also bounds the probability of detecting stains of this size. Site-specific information used to design the sampling and analysis plans will be presented in the investigation approach and objectives subsection for each aggregate in Chapter 5, Addendum 1.

No RFI investigation is currently designed to collect data which meet the requirements of a baseline risk assessment. The development of a defensible sampling and analysis plan for risk assessment investigations requires specification of decision error tolerances. However, data obtained from an RFI investigation can be used to determine if contaminant concentration limits established by SALs have been exceeded, and if additional data collection for use in risk assessment is necessary.

4.3.7 Optimize Design: Develop a Sampling and Analysis Plan

The objective of the last step of the DQO process is to evaluate alternative sampling and analysis plans for data collection and to select the plan that is expected to achieve the DQOs in the most cost-effective manner. For most of the sites sampled in Chapter 5, Addendum 1, a judgmental sampling-analysis plan was developed to meet the screening assessment DQOs. The sampling-analysis plan for each site is presented in the sample locations and methods and laboratory analyses subsection for each aggregate in Chapter 5, Addendum 1.

For a small subset of sites, some quantitative decision performance requirements were established and a statistically based sampling and analysis plan was developed. Statistical design optimization requires pertinent estimates of uncertainty, a general understanding of the underlying distribution of the constituents of concern, and a complete set of DQOs. Professional judgment is relied upon to greater or lesser extent in determining where to take samples. However, even for a sampling and analysis plan where a statistical model helps select the number of samples, determining which analytical methods are appropriate for either a screening assessment or risk-based decision is a process that involves working with the chemists and statisticians to determine the most efficient way to generate data of acceptable quality. Some of the issues considered include: the sensitivity of the method compared to the SAL or other decision point, the performance of the method on LANL matrix samples, turnaround times, and ability to measure multiple constituents of potential interest at once. In most cases, the magnitude of analytical error is expected to be small compared to sampling error; however, during the evaluation of designs measurement error is evaluated to ensure that the expected performance of the method will achieve the stated DQOs.

Assuming the screening assessment yields values higher than the SALs and background for constituents of interest, these data are often valuable in evaluating alternative designs for further data collection in support of risk-based decisions. A variety of statistical survey methods appropriate for estimating means are discussed in the IWP and will be considered in future phases of data collection. In addition, future phases of the RFI will consider

the impact of multiple source terms on contaminant migration and distribution.

4.4 Conceptual Exposure Models for OU 1114

A conceptual exposure model was developed for each PRS aggregate to help identify the location and magnitude of sampling needed to accurately characterize the PRSs at OU 1114. Each PRS aggregate conceptual exposure model includes four elements:

1. Identification of PCOCs;
2. Characterization of the releases of COCs
3. Determination of migratory pathways; and,
4. Identification of human receptors.

Subsection 4.4.1, Potential Contaminants of Concern, is an overview of the PCOC selection. Subsection 4.4.2, Potential Environmental Pathways, discusses the PCOC release mechanisms and migration pathways. Subsection 4.4.3, Potential Human Receptors, contains a conceptual model for each type of PRS that describes potential current and future receptors and potential exposure to site-related constituents.

4.4.1 Potential Contaminants of Concern

The objectives of the Phase I sampling activity, or screening assessment, are to accomplish the following:

1. Confirm the presence or absence of anticipated PCOCs from known site activities;
2. Use broad spectrum analytical methods that will allow for a reasonable determination that additional PCOCs are not present (e.g., the evaluation of tentatively identified compounds from mass spectral scans);
3. Select analytical methods primarily on the basis of sensitivity for anticipated PCOCs at their SALs and secondarily for broad-band spectrum capability; and,

4. Estimate if the concentration of each PCOC is greater than some method threshold.

Chemical constituents that are essential human nutrients are toxic only at very high levels, such as potassium and magnesium, will not be quantified in a baseline risk assessment (EPA 1989, 0305).

The main classes of PCOCs identified for OU 1114 are volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, and radionuclides. These categories correspond to a method of analysis used to quantify their presence in samples. Section 7.0 of Appendix D, Sampling Methods, lists the LANL ER standard operating procedures used for these standard suites of chemicals. Types of VOCs found at OU 1114 include solvents and chemicals used in laboratory projects. SVOCs that may be found at OU 1114 include PCBs used in transformers. Pesticides and herbicides were also stored, handled, or applied at specific locations. These substances are measured by specific analytical suites.

4.4.2 Potential Environmental Pathways

Chemical or radionuclide PCOCs at OU 1114 may have been released into the environment via drainages, outfalls, landfill areas, spills, leaks, or spattering to surface soil from storage areas, storage tanks, or surface impoundments.

After potential contaminants have been released into the environment, they can potentially migrate via: 1) liquid infiltration into near-surface or subsurface soils that may reach groundwater via faults or surface water via seeps, 2) volatilization into ambient air, 3) wind entrainment of contaminated dust and deposition onto surface soils, and 4) surface water overflow and then runoff resulting in the contamination of sediments in drainage channels.

Table 4-4 summarizes the major chemical migration pathways, environmental media that may be contacted by receptors, and resulting potential human exposure pathways. Other pathways that may exist, but are considered less significant, include uptake by animals (e.g., cows and elk) from ingestion. The contribution of these exposure pathways is likely to be minor in comparison to pathways listed in Table 4-4.

TABLE 4-4

SUMMARY OF MAJOR MIGRATION PATHWAYS, CONTACT MEDIA, AND RESULTING POTENTIAL HUMAN EXPOSURE ROUTES

MIGRATION PATHWAYS	CONTACT MEDIA	RESULTING POTENTIAL HUMAN EXPOSURE RATES
A. Liquid infiltration into near-surface or subsurface soils	1. PCOCs in subsurface soils	1. None (unless erosion, then refer to exposure routes for B and C)
B. Wind entrainment and dispersal of surface soil and atmospheric dispersion of volatiles	1. PCOCs deposited on surface soils and edible plant surfaces 2. PCOCs in air (particulate matter and volatile compounds)	1. Ingestion of soil, dermal contact with soil, and ingestion of plants 2. Inhalation of fugitive dust or volatile compounds
C. Surface water runoff carrying soil/sediment in suspension and in solution	1. PCOCs deposited in drainage sediments 2. PCOCs released to surface waters 3. Contaminated surface water infiltrating surface and subsurface soils	1. Ingestion of sediments and dermal contact with sediments 2. Ingestion of surface water and dermal contact with surface water 3. Ingestion of soil and dermal contact with soil
D. Soil erosion and excavation, exposing subsurface contaminated soil to the surface	1. Feeds wind dispersal (B) and surface water runoff (C)	1. Refer to exposure routes for B and C

Perched groundwater may be present at OU 1114. Potential contaminant movement from leaching or infiltration into the vadose zone from PRSs can create a possible pathway to perched groundwater via faults or fractures. Potential migration of PCOCs to the main aquifer is not considered to be a major risk because the aquifer is more than 800 ft deep; therefore, groundwater is not a plausible pathway for migration of constituents. Section 3.0 of Chapter 3 contains a discussion on the hydrology of the main aquifer beneath OU 1114 (LANL 1993, 1090). Currently, there are no groundwater wells on site.

4.4.3 Potential Human Receptors

This subsection discusses how people could potentially be exposed to site-related PCOCs in the absence of site remediation and presents the conceptual site model. Currently, the land within the boundaries of OU 1114 is used for Laboratory operations, two privately owned cement mixing plants (on land leased from DOE), and the privately owned Royal Crest Trailer Court (on privately owned land) located approximately 0.25 mile east of the nearest PRS (61-004) within OU 1114. Future land use could encompass recreational users and continued Laboratory operations; future residential use is possible but not as likely. Therefore, the following general land-use categories for OU 1114 have been identified: 1) continued Laboratory operations; 2) recreational land use; and 3) residential land use.

4.4.3.1 Conceptual Site Model

The conceptual exposure models (Figs. 4-3 and 4-4) identify historical sources of environmental release, migration, potential current sources of contaminants, potential release mechanisms, contact media, and exposure routes for each PRS. Elements of the conceptual models are presented in Table 4-5.

Figure 4-3 presents the conceptual exposure model for PRSs that have potential surface soil contamination. The conceptual exposure model for potential surface and subsurface contamination is presented in Fig. 4-4.

Formulation of the conceptual exposure models for OU 1114 is based on available PRS information only. Further refinement or development of separate models may be necessary based on data gathered through the RFI.

Site-specific information on PRS aggregates, such as PCOCs and migration pathways, is in Chapter 5, of the RFI Work Plan for OU 1114 (LANL 1993, 1090) and Addendum 1 to that work plan.

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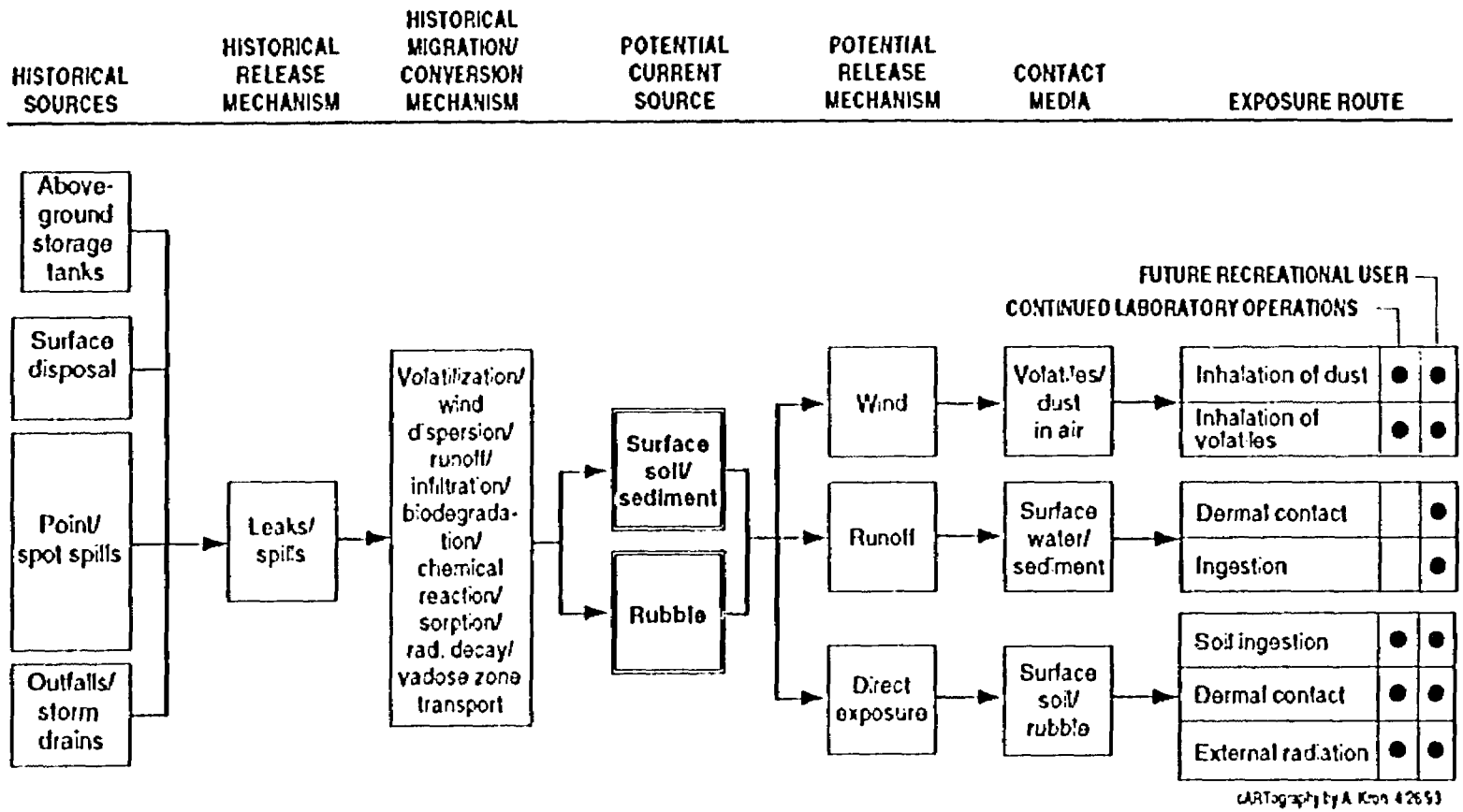

Fig. 4-3. Conceptual exposure model for potential surface soil contamination.

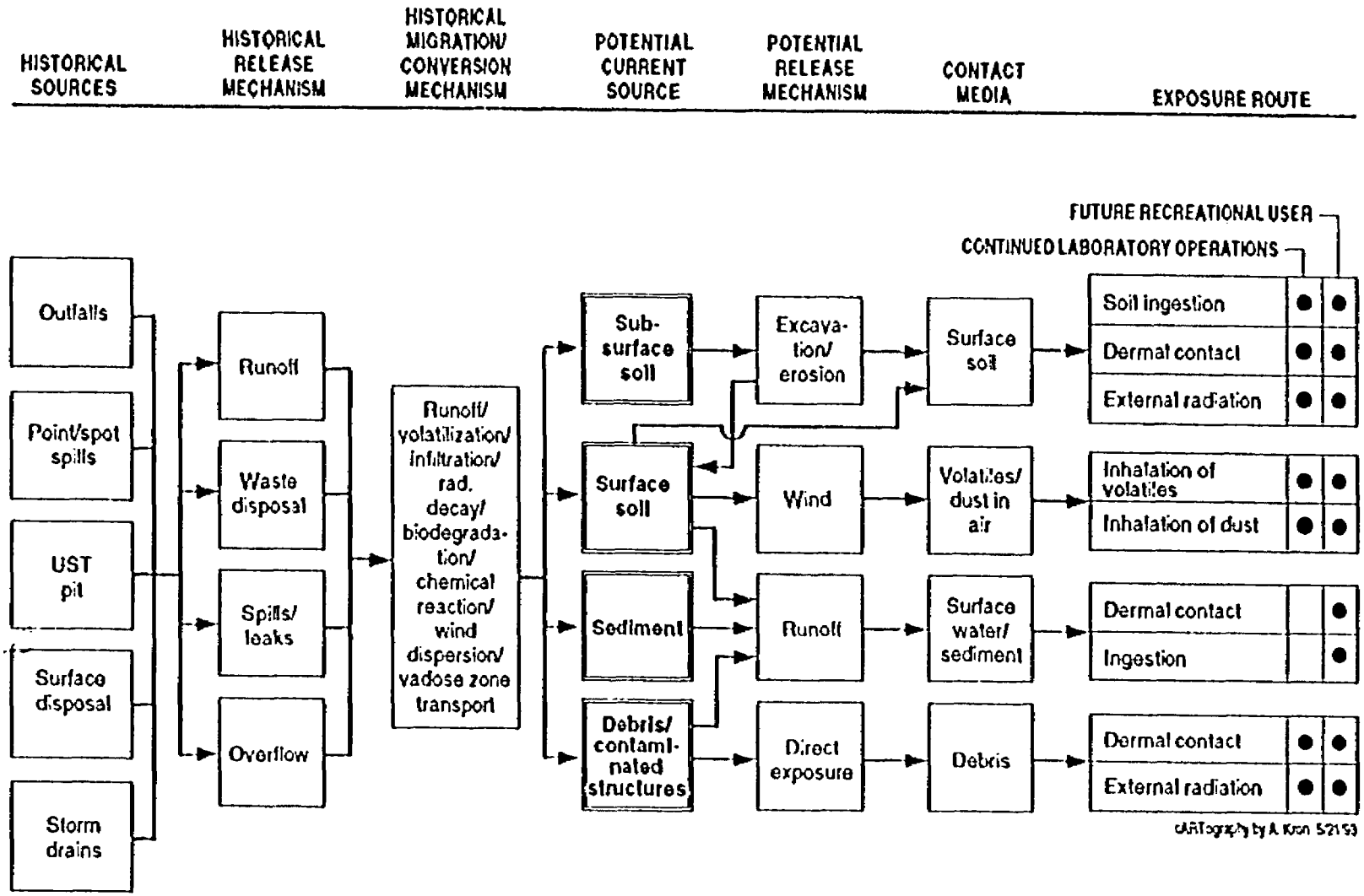

Fig. 4-4. Conceptual exposure model for surface and subsurface contamination.

4.4.3.2 Potential Human Exposure

If soil is found to be contaminated (SALs are exceeded) in Phase I or Phase II sampling, the human exposure to these contaminants will be quantified in a baseline risk assessment. Human exposure is estimated through a model of the reasonably maximum-exposed individual who is defined through assumptions of current and future land use

Currently, no commercial dairy or beef operations are located in the vicinity of OU 1114. In the future, if the land reverts to National Forest, limited cattle grazing may be a possibility. The number of cows that this area would be able to sustain is small because of the semiarid climate. Cattle would have to graze over a large area. Therfore, this exposure scenario will not be evaluated in a baseline human health risk assessment because it is expected to be minor in comparison to scenarios already being evaluated. Refer to the 1993 IWP for ER programmatic guidance on probable land use scenarios (LANL 1993, 1017).

Depending on site-specific parameters (i.e., types of PCOCs present or migration potential), the worst-case exposure scenario (i.e., the reasonable maximum-exposed individual) may vary. For PRSs in which more than one scenario may be applicable, all exposures will be calculated to determine the worst-case scenario. For any baseline risk assessment, the 95% upper confidence limit on the arithmetic average concentration of COCs over the appropriate exposure area, either surface or subsurface soils, is sufficient to quantify human exposure. It is assumed that contact with soils in all areas of the site is equally probable. Data are averaged over an exposure unit, which is determined by the land-use scenario.

Assumptions made for the three land-use scenarios are developed below.

4.4.3.2.1 Continued Laboratory Operations Scenario

In the foreseeable future, land use is likely to be similar to current Laboratory operations. Populations of on-site workers (individuals who work on or near the site) and construction workers (individuals who would be exposed to near-surface and subsurface soils through various activities including excavation) are estimated to be the most likely reasonable maximum-exposed

TABLE 4-5

SUMMARY OF CONCEPTUAL MODEL ELEMENTS

PATHWAYS/MECHANISM	CONCEPT/HYPOTHESES
HISTORICAL SOURCES	• Operations/processes that contributed to the creation of the PRS (i.e., storage area, etc.)
PRS RELEASE MECHANISM	• Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, leaching, dumping, or disposing into the environment
MIGRATION PATHWAY/ CONVERSION MECHANISM	
Atmospheric dispersion	• Entrainment is limited to chemicals in surface soils
Particulate dispersion	• Entrainment and deposition are controlled by soil properties, surface roughness, vegetative cover and terrain, as well as atmospheric conditions
Volatilization	• Volatilization occurs to volatile organic compounds in surface soils, subsurface soils, and surface water
Surface water runoff	• Surface runoff is directed by natural topographic features or manmade diversions and flows toward the canyons. A topographic low can cause the water to pond on the mesa top, but in most cases the water will flow into the canyon
	• Chemical transport by surface runoff can occur in solution, sorbed to suspended sediments, or as mass movement of heavier bed sediments
	• Surface runoff may carry chemicals beyond the OU boundary
	• Contaminated surface runoff may infiltrate the canyon-bottom alluvium
Sediments	• Surface soil erosion and sediment transport is a function of runoff intensity and soil properties
	• Chemicals dispersed on the soil surface can be collected by surface water runoff and concentrated in sedimentation areas in drainages
	• Erosion of drainage channels can extend the area of contaminant dispersal in the drainage
Alluvial aquifers	• Surface runoff discharged to the canyons may infiltrate into sediments of channel alluvium
Infiltration	• Infiltration into surface soils depends on the rate of precipitation or snowmelt, antecedent soil water status, depth of soil, and soil hydraulic properties
	• Infiltration into the tuff depends on the unsaturated flow properties of the tuff
POTENTIAL RELEASE MECHANISM	
	• Joints and fractures in the tuff may provide additional pathways for infiltration to enter the subsurface regime
Leaching	• Storm water/snowmelt can dissolve chemicals from soil or other solid media, making them available for contact
	• Water solubility of chemicals and their relative affinity for soil or other solid media affects the ability of leaching to cause a release

TABLE 4-5 (Continued)

SUMMARY OF CONCEPTUAL MODEL ELEMENTS

PATHWAYS/MECHANISM	CONCEPT/HYPOTHESES
	• Leaching and subsequent resorption can extend the area of contamination
Soil erosion	• The erosion of surface soils is dependent on soil properties, vegetative cover, slope and aspect, exposure to the force of the wind, and precipitation intensity and frequency
	• Depositional areas as well as erosional areas exist, and erosive loss of soil may not occur in all locations
	• Storm water runoff can mobilize soils/sediments, making them available for contact
	• Storm intensity/frequency, physical properties of soils, topography, and ground cover determine the effectiveness of erosion as a release mechanism
	• Erosion may also enlarge the contaminated area
Mass wasting	• The loss of rock from the canyon walls is a discontinuous, observable process
	• The rate of the process is extremely slow
Resuspension (wind suspension)	• Wind suspension of contaminated soil/sediment as dust makes chemicals available for contact via inhalation/ingestion
	• Physical properties of soil (e.g., silt content, moisture content), wind speed, and size of exposed ground surface determine effectiveness of wind suspension as a release mechanism
	• Wind suspension can enlarge the area of contamination and create additional exposure pathways, such as deposition on plants followed by plant consumption by humans/animals
Excavation	• Manual or mechanical movement of contaminated soil during construction, remediation, or other activities makes contaminated soil available for dermal contact, ingestion, and inhalation as dust
	• The method of excavation (i.e., type of equipment), physical properties of soil, weather conditions, and magnitude of excavation activity (i.e., depth and total area of excavation) influence the effectiveness of excavation as a release mechanism
	• Excavation can increase or decrease the size of the contaminated area, depending on how the excavated material is handled
EXPOSURE ROUTE	
Inhalation	• Vapors, aerosols, and particulates (including dust) can be inhaled and absorbed by the lungs and mucous membranes.
	• Physical and chemical properties of airborne chemicals influence the degree of retention in the body after being inhaled
Ingestion	• Ingestion of soil, water, food, and dust can lead to chemical intake via absorption in the gastrointestinal tract

TABLE 4-5 (Continued)

SUMMARY OF CONCEPTUAL MODEL ELEMENTS

PATHWAYS/MECHANISM	CONCEPT/HYPOTHESES
Direct contact	• Some hazardous chemical constituents will absorb through the skin when in contact with contaminated surfaces of soil, tuff, or rubble
	• Physical and chemical properties of chemicals influence the degree of dermal absorption
	• Factors such as skin moisture and temperature affect the degree of dermal absorption
External penetrating radiation	• External, or whole body radiation, can occur through exposure to gamma-ray-emitting radionuclides that may be present in soil either directly through the soil or re-entrained dusts
	• Exposure to penetrating radiation can also occur through inhalation or ingestion when radionuclide-contaminated soil or tuff surfaces erode and/or dusts become re-entrained

individuals. Therefore, these are the exposure scenarios that will be evaluated under the land-use scenario of continued Laboratory operations.

On-site workers (e.g., maintenance workers, office workers) are expected to be routinely exposed to contaminated media; therefore, this scenario is considered a conservative exposure scenario for those PRSs in OU 1114 that consist of potential surface contamination (0 to 6 in.) on the mesa top. Surface contamination above SALs will be evaluated for both current and future risks in a baseline risk assessment using the on-site worker scenario. The types of PRS aggregates with potential surface contamination on the mesa top include: suface disposal, point/spot spill(s), outfalls, and storm drains.

The construction worker is expected to be exposed to subsurface contamination during excavation activities. Once subsurface soil is excavated and brought to the surface, on-site workers could also be exposed. Therefore, PRSs in OU 1114 that consist of subsurface contamination above SALs will be evaluated in a baseline risk assessment using the construction worker and on-site worker scenarios. The types of PRS aggregates with potential subsurface contamination include: surface disposal, storm drains, USTS, outfalls, point/spot spills, and disposal pits.

Exposure pathways relevant to workers include: 1) inhalation of fugitive dust or volatile compounds; 2) incidental ingestion of contaminated soils; 3) direct dermal contact with contaminated soils; and 4) external radiation (Table 4-6).

4.4.3.2.2 Recreational Scenario

The recreational scenario is a current scenario in some areas of OU 1114 and in the most probable future scenario for PRSs consisting of surface contamination (0 to 6 in.) on the canyon wall or canyon bottom. The recreational scenario may include camping, hiking, hunting, and possibly limited construction.

PRSs in OU 1114 that consist of surface contamination above SALs on canyon walls and/or canyon bottoms will be evaluated in a baseline risk assessment using the recreational scenario. PRSs that are located on the canyon wall and/or bottom are primarily outfalls. PRSs that have surface water runoff into a drainage channel or an associated outfall, will also be evaluated using the recreational scenario.

Recreational users of the area could come into contact with COCs through ambient air, surface soil, sediments in drainage channels, and pooled surface water.

Exposure pathways associated with recreational activities include: 1) inhalation of fugitive dust; 2) soil ingestion; 3) dermal contact with soil; 4) external radiation; 5) dermal contact with surface water; and, 6) accidental ingestion of surface water (Table 4-7). Campers are assumed to carry in potable water and food; therefore, exposure through consumption of contaminated edible plants (piñon and berries) is an insignificant pathway in the recreational scenario. No body of water large enough to support a consistent supply of game fish exists; therefore, exposure to contaminants by consuming contaminated fish is not a viable pathway for this site.

TABLE 4-6

SUMMARY OF EXPOSURE ROUTES IN THE CONTINUED LABORATORY OPERATIONS SCENARIO

EXPOSURE ROUTE	ASSUMPTIONS
1. Inhalation of ambient air (fugitive dust or volatiles)	• Fugitive dust is generated by soil disturbances (i.e., bulldozers, trucks and other earth-moving equipment) during construction activities • Construction activities may expose subsurface chemicals to the surface (i.e., excavation) • There may be volatile organic compounds in near-surface and subsurface soils that would contribute to the inhalation exposure • For dust transport indoors, it can be assumed that indoor concentrations are less than those outdoors • For vapor transport indoors, concentrations indoors and outdoors can be assumed to be equivalent, except at sites where subsurface soil gases are entering indoors; in this case, vapor concentrations inside could exceed those outdoors
2. Incidental ingestion of soil	• Incidental soil ingestion of surface or subsurface soils may occur as a result of construction activities • Office workers would be expected to contact much less soil and dust than construction workers
3. Dermal contact with soil	• Skin surface area available for contact with soil includes arms, hands, face, and head
4. External radiation	• Irradiation from radionuclides on the ground surface may occur

TABLE 4-7

SUMMARY OF EXPOSURE ROUTES IN THE RECREATIONAL SCENARIO

EXPOSURE ROUTE	ASSUMPTIONS
1. Inhalation of ambient air (fugitive dust or volatiles)	• Fugitive dust is generated by the wind and during recreational activities (e.g., dirt biking) • There may be volatile constituents on site that would contribute to the inhalation exposure
2. Incidental ingestion of soil/sediment	• Incidental soil/sediment ingestion of surface soil or sediments may occur as a result of recreational activities (standard daily soil ingestion rates for adults and children are used)

TABLE 4-7 (Continued)

SUMMARY OF EXPOSURE ROUTES IN THE RECREATIONAL SCENARIO

EXPOSURE ROUTE	ASSUMPTIONS
3. Dermal contact with soil/sediment	• Skin surface area available for contact with soil includes arms, hands, face, legs, upper body, and head (the camping event occurs in warm weather).
4. External radiation	• Irradiation from radionuclides on the ground surface may occur
5. Dermal contact with surface water	• Ephemeral streams may be present as a result of snowmelt and summer rainfall • Rainfall events result in pooled water • Standing water occurs after the rainfall event before it seeps into the ground
6. Accidental ingestion of surface water	• Ephemeral streams may be present as a result of snowmelt and summer rainfall • Rainfall events result in pooled water • Standing water occurs after the rainfall event before it seeps into the ground

4.4.3.2.3 Residential Scenario

The residential scenario is considered an unlikely future land-use scenario for OU 1114; however, since residential development cannot be ruled out, this potential exposure scenario must be considered. On-site residents would be exposed routinely to near-surface soils through activities such as recreation and gardening; therefore, this scenario is considered a conservative exposure scenario for those PRSs in OU 1114 that consist of potential surface contamination (0 to 6 in.) on the mesa top. Surface contamination above SALs will be evaluated for both current and future risks in a baseline risk assessment using the on-site residential scenario.

The on-site resident may be exposed to subsurface contamination if it is brought to the surface during excavation for a home, or may be exposed to subsurface volatile contamination that migrates in vapor form into the on-site residence. Therefore, PRSs in OU 1114 that consist of subsurface contamination above SALs will be evaluated in a baseline risk assessment using the on-site residential scenario.

Exposure pathways relevant to on-site residents include: 1) inhalation of fugitive dusts or volatile compounds; 2) incidental ingestion of contaminated soils or surface water; 3) direct dermal contact with contaminated soil or surface water; 4) ingestion of produce grown in contaminated soil, and 5) external radiation (Table 4-8).

TABLE 4-8

SUMMARY OF EXPOSURE ROUTES IN RESIDENTIAL SCENARIO

EXPOSURE ROUTE	ASSUMPTIONS
1. Inhalation of ambient air (fugitive dust or volatiles)	Fugitive dust is generated by wind and outdoor activities (e.g., gardening) There may be volatile constituents on site that would contribute to the inhalation exposure
2. Incidental ingestion of soil	Incidental soil/sediment ingestion may occur as a result of outdoor activities (standard daily soil ingestion rates for adults and children are used)
3. Dermal contact with soil	Skin surface area available for contact with soil includes arms, hands, face, legs, upper body, and head
4. External radiation	Irradiation from radionuclides on the ground surface may occur
5. Dermal contact with surface water	Ephemeral streams may be present as a result of snowmelt and summer rainfall Rainfall events result in pooled water Standing water occurs after rainfall event before it seeps into the ground
6. Accidental ingestion of surface water	Ephemeral streams may be present as a result of snowmelt and summer rainfall Rainfall events result in pooled water Standing water occurs after rainfall event before it seeps into the ground
7. Ingestion of produce grown on site	Thirty percent of produce eaten at the residence is grown at the residence.

4.5 Ecological Risk Assessment

An ecological risk assessment may be conducted for OU 1114 to quantify the risk posed to nonhuman systems as a result of the release of hazardous materials. This ecological risk assessment may be performed as part of the RFI, and the results may be considered when comparing remedial alternatives during corrective measures studies. The ecological risk assessment may also support a natural resource damage assessment

(NRDA) as required by the Comprehensive Environmental Response, Compensation, and Liability Act (DOE 1989, 0078). The purpose of the NRDA is to determine whether natural resources have been damaged as a result of the release of hazardous materials.

The quantitative and qualitative criteria that define the environmental standards for protection of nonhuman receptors are specified in the National Environmental Policy Act (DOE 1985, 0061), the Endangered Species Act (USFWS 1988, 17-795), the Clean Water Act, and executive orders on wetlands and historic preservation. These laws and their enabling regulations define federal and state endangered, threatened, and sensitive plant and animal species;

sensitive areas (such as floodplains or wetlands); sensitive and unique habitats; and water quality criteria for protection of aquatic receptors.

A discussion of the general approach that will be followed in conducting an ecological risk assessment is presented in Appendix L of the IWP (LANL 1993, 1017). The ecological risk assessment may include comparison of contaminant concentrations in environmental media to ecotoxicological screening action levels (ESALs), which are conservative screening criteria used to determine if further investigation or action may be warranted based on potential threat to nonhuman receptors (Ebinger et al. 1994, 17-1214).

The first step in the ecological risk assessment process is the biological evaluation of the site. The purpose of this evaluation is to characterize the biological community within the operable unit. This evaluation includes surveys for threatened and endangered species, sensitive areas, and plant community structure. Biological surveys are defined by levels, with each successive level representing a more specific evaluation of a more defined subset of the ecosystem.

Level 1 (reconnaissance), Level 2 (habitat evaluation), and Level 3 (species-specific evaluation) biological field surveys have been conducted for OU 1114 as part of the OU biological assessment (Cross 1994, 17-1215). The results of the habitat evaluation indicated the following habitat types within OU 1114: mixed conifer, ponderosa pine, ponderosa pine/piñon, piñon/juniper, riparian (living or located on the bank of a natural watercourse), and wetlands. Based

on the results of the habitat evaluation, the LANL database of threatened and endangered species was consulted to identify species that could occur within habitat types identified for OU 1114. Additionally, state and federal lists of protected species were consulted and species that may occupy the habitats identified for OU 1114 were noted. As a result of this biological assessment, the following species and habitats of potential concern were identified:

- The checker lily (*Fritillaria atropurpurea*), identified as a sensitive species by New Mexico, and the wood lily (*Lilicum philadelphicum*), a protected species in New Mexico and a candidate for federal protected species status, may exist on the moist north-facing canyon slopes and in riparian mixed conifer areas.

- The spotted bat (*Euderma maculatum*), a protected species in New Mexico and a candidate for federal protected species status, may inhabit areas of OU 1114. However, a 1992 bat survey captured no bats, and an additional survey may be necessary to establish presence or absence.

- The Jemez Mountain salamander (*Plethodon neomexicanus*), a protected species in New Mexico and a candidate for federal protected species status, is known to occupy areas in the vicinity of OU 1114; a site-specific survey may be necessary to establish presence or absence.

- The northern goshawk (*Accipiter gentilis*), a candidate for federal protected species status, may occupy areas within OU 1114 because of good foraging habitat; a site-specific survey may be necessary to establish presence or absence.

- Two wetlands habitats in Sandia Canyon (a marsh and a stream channel) are potential habitats for the meadow jumping mouse (*Zapus hudsonius*), a protected species

in New Mexico and a candidate for federal protected species status. However, recent small mammal trapping conducted in the canyon did not capture any of this species (Raymer and Biggs 1994, 17-1216). Additional surveys may be necessary to establish presence or absence. It should be noted that Sandia Canyon is potentially impacted by STP and various LANL outfalls, as well the Los Alamos municipal landfill. These sources of surface water have created artificial wetlands with compromised water quality and a suppressed population of macroinvertebrates (Cross 1994, 17-1217; Bennett 1994, 17-1218).

Habitats in OU 1114 that could support the species listed above are those in more remote areas that are currently undisturbed and include canyon slopes and bottoms and the eastern areas of the mesas.

As a result of the operable unit biological assessment, best management practices were identified that will be applied to sampling and remedial activities at OU 1114 to reduce the impacts to potentially sensitive species and habitats. These practices include delineation of wetlands boundaries to ensure sampling is conducted outside areas that meet wetlands criteria, minimizing disturbance of habitat during sampling, and notifying the LANL Biological Resource Evaluations Team before disturbances other than soil sampling are initiated.

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Memo from Elliott P. Laws, Assistant Administrator to Regional Administrators

Please search "17-1013" with & replace "1209"

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Chapter 5 [illegible] 07-04-95

EDITING WORKSHEET

Acronym or Hyphenation List

A AOC 12-1	B	C COPCs 0-1 CMS 0-1 CMR 12-1
D DQOs 0-1 dpm 15-3 D+D 17-3	E EC 0-1 EPA 12-1 ESM 16-6 ER 16-6 ESOI 22-3	F FIMAS 0-4 FID 0-4 FTL 20-13
G	H HE 22-1	I
J JCI 23-1	K	L LLW 23-1
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P PRGs 0-1 PCR 0-2 PID 0-4 ppm 12-3	Q QC 0-1	R RFI 0-1
S SALI 0-1 SVOC 0-2 SWMU 12-1 SWSC 12-3	T TPH 0-3 TAL 11-1 TCLP 12-3 TCA 16-5 TCE 16-5 TRU 23-1	U UST 5-21-1
V VOC 0-3 VOA 17-3	W	XYZ XRF 17-4

5.0 INTRODUCTION

5.0.1 Data Quality Objectives

Data quality objectives (DQOs) specify the quality (and quantity) of data collected during a RCRA facility investigation (RFI) to ensure a technically sound basis for evaluating the need and approaches for no further action (NFA), expedited cleanup (EC), or corrective measures study (CMS). DQOs set acceptable limits for uncertainty in sampling data for each specific investigation activity in accordance with the intended data use. Different data uses require different levels of analytical and sampling certainty.

This subsection presents the generic aspects of DQOs applied to the site investigations described in the remainder of Chapter 5. See Chapter 4 for a brief discussion of the DQO process. The presence of contamination is not known for most potential release sites (PRSs) in this chapter. Therefore, the sampling and analysis plans are designed to determine if there has been a release at a site where observed contaminant concentrations exceed screening action levels (SALs). The sampling and analysis plans are also designed to ensure sufficient data is collected to make a decision about a site.

Each sampling analysis plan begins with a presentation of background information on the types of past and present site activities and information describing potential or documented releases. Potential contaminants of concern (PCOCs) and site boundaries are then identified from this archival information.

Sample collection will be biased or random, or a combination of both, depending on what is known about potential contamination at a site. The key assumptions of the sampling schemes will be confirmed by collection of quality control (QC) samples, including duplicates and samples downgradient of expected maximum PCOC concentration locations.

If analytical results indicate that the maximum concentration of all PCOCs is below SALs or background levels, the PRS will be recommended for NFA. If concentrations of PCOCs exceed SALs or background levels, a baseline risk assessment will be conducted to determine whether to proceed to NFA, EC,

or CMS. The selection of additional action will be based on risk assessment results and the availability of an obvious site remedy.

5.0.2 Development of Site-Specific Sampling and Analysis Plans

The site-specific sampling and analysis plans present a preliminary evaluation of existing data and information collected during the initial scoping process. These plans summarize site backgrounds and physical settings, as well as outline the sampling rationale and guidelines for field implementation. Site-specific information and data used to develop the initial site descriptions and plans included aerial photographs, site history, ownership (operating Laboratory group), occurrence reports, engineering drawings, topography, geology, potential contaminants of concern and media, and other pertinent details. The information may have also included previous site visits, sampling events, and previous cleanup actions. Results from any previous sampling events were summarized in terms of physical and chemical characteristics, contaminants identified, and concentrations of contaminants.

5.0.3 Biased Sampling Approach

Biased sampling involves sampling areas where contaminants are known or suspected to have been released, but quantitative information on contaminant concentration is not available. Thus, biased sampling schemes are based on historical information about the PRSs, the topography of the site, the chemical properties and migration potential of the PCOCs, and the chemical and physical properties of the soil.

Historical information about PRSs is derived from archival and site investigations, interviews with personnel assigned to the area at the time of the release, and period maps and photographs.

Topographic factors affecting the migration potential of PCOCs include drainage patterns and likely sediment deposition areas, the presence of low-lying areas in which water might pool, and soil conditions.

Site-specific soil factors affecting the migration potential of the PCOCs include soil and sediment pH, texture, permeability, moisture, temperature, organic matter content, and the presence of fractures in the tuff. For example, most heavy metals are relatively immobile in the environment unless acidic

conditions are present in the soil. Semivolatile organic compound (SVOC) migration potential is dependent upon the organic compound's solubility, polarity, and susceptibility to photooxidation. Polychlorinated biphenyl (PCB) mobility is dependent upon soil moisture, temperature, and microbiology. While no composite samples will be taken specifically to characterize these factors at each PRS, the effects of observable or predictable soil characteristics on PCOC migration will be considered in developing the biased sampling plans.

Further, chemical and physical properties of the PCOCs regardless of soil conditions will also affect the migration potential of PCOCs. For example, volatile organic compounds (VOCs) and total petroleum hydrocarbons (TPH) are susceptible to volatilization in surface soils and during transport, and are therefore not expected to be found at any distance from the source.

Using this information, sampling sites can be selected where contaminants are most likely to exist. The primary advantage of biased sampling over random sampling is that fewer samples are collected with biased sampling and with a greater degree of confidence that contamination, if present, will be detected. This degree of confidence is directly related to the confidence placed in the historical data and understanding the factors listed above.

5.0.4 Random Sampling Approach

Random sampling is a statistical sampling method that is not based on prior knowledge of contaminant distribution. In the random sampling design, a grid system is established and used together with a random number generator to select sampling points at node locations on the grid. The number of samples collected is determined by a variety of factors, including the degree of confidence desired that any contamination present will be detected, the viability of the media from which the samples are to be taken, and the cost of collecting and analyzing the samples.

The higher the level of confidence desired, the greater the number of samples that must be collected. The number of samples may also be determined by the following equation:

$$P = 1 - (1-f)^N$$

Where: P = desired probability; N = number of samples;

f = fraction of site assumed to be contaminated

5.0.5 Sampling Methods

Soil samples will be collected in 12-in. intervals from the surface down to the clay-rich horizon expected to be found above the soil-tuff interface throughout much of OU 1114 (Nyhan et al. 1978, 0161). The clay-rich horizon is expected to form a permeability barrier through which most PCOCs will not migrate. If no clay-rich horizon is found, samples will be collected in 12-in. intervals down to the soil-tuff interface unless otherwise stated. To minimize volatilization, an aliquot of soil will be removed for laboratory analyses of SVOCs and/or TPH (if applicable) prior to homogenization of each interval. VOCs will be collected as described in field screening. Because of the expected shallow depth to the soil-tuff interface for all outfalls being sampled in this work plan, one sample will be taken from the 0 to 12-in. interval or to depth if the depth to the soil-tuff interface is 18 in. or less. If the depth to the soil-tuff interface is greater than 18 in., an additional sample will be collected as described above. Composite samples will be taken at the discretion of the field team leader in order to ensure sufficient volume of sampling material to complete the required analyses.

All sample sites will be land surveyed and assigned a sample location identification number from the Facility for Information Management, Analysis, and Display (FIMAD). The number of samples collected at each site will depend upon the depth to bedrock.

5.0.5.1 Field Screening

For health and safety purposes, all soil samples will be field screened for VOCs with a photoionization detector (PID) and/or a flame ionization detector (FID) prior to homogenization. If VOC field screening indicates a concentration greater than background readings, an adjacent sample will be collected at the sample interval where the highest VOC concentrations were detected in the original sample. Background is defined as the PID/FID reading in ambient air prior to screening the soil samples.

In the absence of field-detected VOCs, 10% of sample locations will be randomly selected for confirmatory sampling. In no case will fewer than two confirmatory samples be collected. Since volatile organic constituents are less likely to be seen in the surface soil, adjacent confirmatory VOC samples will be collected from the 6 to 18-in. depth interval and will be submitted for laboratory analysis to validate field-screening data.

All samples will also be field screened for radiological constituents for health and safety purposes using a hand-held gross gamma survey instrument. If the radioactivity field screening results are three standard deviations or more above background for a sample it will be submitted for laboratory analysis for gross alpha/beta analysis, gamma spectroscopy, and tritium.

Field Laboratory Analysis

At each PRS, the mobile chemistry van and/or the mobile radiological laboratory may be utilized for sample analysis instead of a fixed laboratory if the mobile laboratories can duplicate the appropriate analysis method and level of detection. Use of the mobile laboratories will be determined based on the need for real-time data in order to make additional sampling decisions and on the cost-effectiveness of bringing the mobile laboratories to the PRS. Additional information on the use of the mobile chemical analysis van and the mobile radiation detection van is found in Appendix D of Addendum 1 to the RFI Work Plan for OU 1114.

5.0.6 Support Activities Prior to Mobilization

Existing information and data will be reviewed and visual site inspections will be completed prior to starting fieldwork. Information and data obtained after the sampling plans are drafted should be documented within this review process. Quality assurance information regarding existing data should be considered because it is important to establish if sampling will be needed to verify or simply supplement existing information.

Visual inspections should be conducted at each site to confirm the locations and dimensions of structures, fencing, utilities, drainage ditches, vegetation, topography, and other relevant physical features. Field notes documenting current site conditions should be compared to (or supplement) site descriptions in the sampling plan. Additionally, site observations should be

used to evaluate proposed sampling strategies (visual evidence, methods, and locations) and potential work and support areas at each site. Specific biased and/or random sampling locations can be established during visual site inspections. Biased locations are selected based on visual observations, evidence of contamination, and sampling rationale. Random locations are selected using area grids and a random number generator to identify specific grid nodes as sampling points.

5.12 SWMU 3-054(e) and C-3-006: Mortandad Canyon Outfall

5.12.1. Description and History

The PRSs evaluated in this aggregate include an industrial waste line manhole, area of concern (AOC) C-3-006, that overflowed to a TA-3 storm sewer and discharged to an outfall at SWMU 3-054(e). The industrial waste line manhole was located near the corner of Diamond Drive and Pajarito Road. SWMU 3-054(e) is an outfall located in upper Mortandad Canyon (Fig. 5-12-1). Because overflow from the manhole is a potential source of contamination for outfall SWMU 3-054(e), these PRSs can be evaluated using a single sampling and analysis plan.

SWMU 3-054(e) is the outfall of a TA-3 storm sewer that discharges via a corrugated metal pipe to Mortandad Canyon. Effluent flows down a steep slope (45°) for a distance of approximately 20 ft before it joins the ephemeral stream on the bottom of the canyon. Three sediment catchment basins have formed within the discharge area. The outfall typically discharges a steady, low-volume flow of effluent that originates from several sources at TA-3-29. These sources include drainage from roofs over the west wing, where towers vent filtered exhaust, and surface water runoff from the asphalt area around the building [including the dumpster areas identified as SWMUs 3-004(c and d)]. This outfall is identified by National Pollutant Elimination Discharge System (NPDES) permit Environmental Protection Agency (EPA) 03A021. Currently, the Laboratory monitors the outfall effluent quarterly and reports flow rate, total suspended solids, chlorine, pH, and total phosphorus as required under NPDES.

SWMU 3-054(e) received effluent from a one-time overflow in 1974 from the industrial waste manhole, C-3-006. The overflow resulted from a plug in the industrial waste line and was estimated to be between 500 to 1 000 gal. of radioactive liquid waste. The effluent from the overflow spilled to the surrounding paved area, traveled north along Diamond Drive, flowed into the storm sewer via a storm drain grate, and ultimately discharged into upper Mortandad Canyon through outfall SWMU 3-054(e) (LANL 1990, 17-325). A small dam was built in the streambed at the base of the canyon to contain the effluent. Subsequent cleanup action, based solely on residual radioactive contamination levels of 25 pCi/g, removed approximately 142 ft^3 of contaminated soil from Mortandad Canyon (LANL 1990, 17-325). Hazardous constituents were not evaluated during the cleanup action.

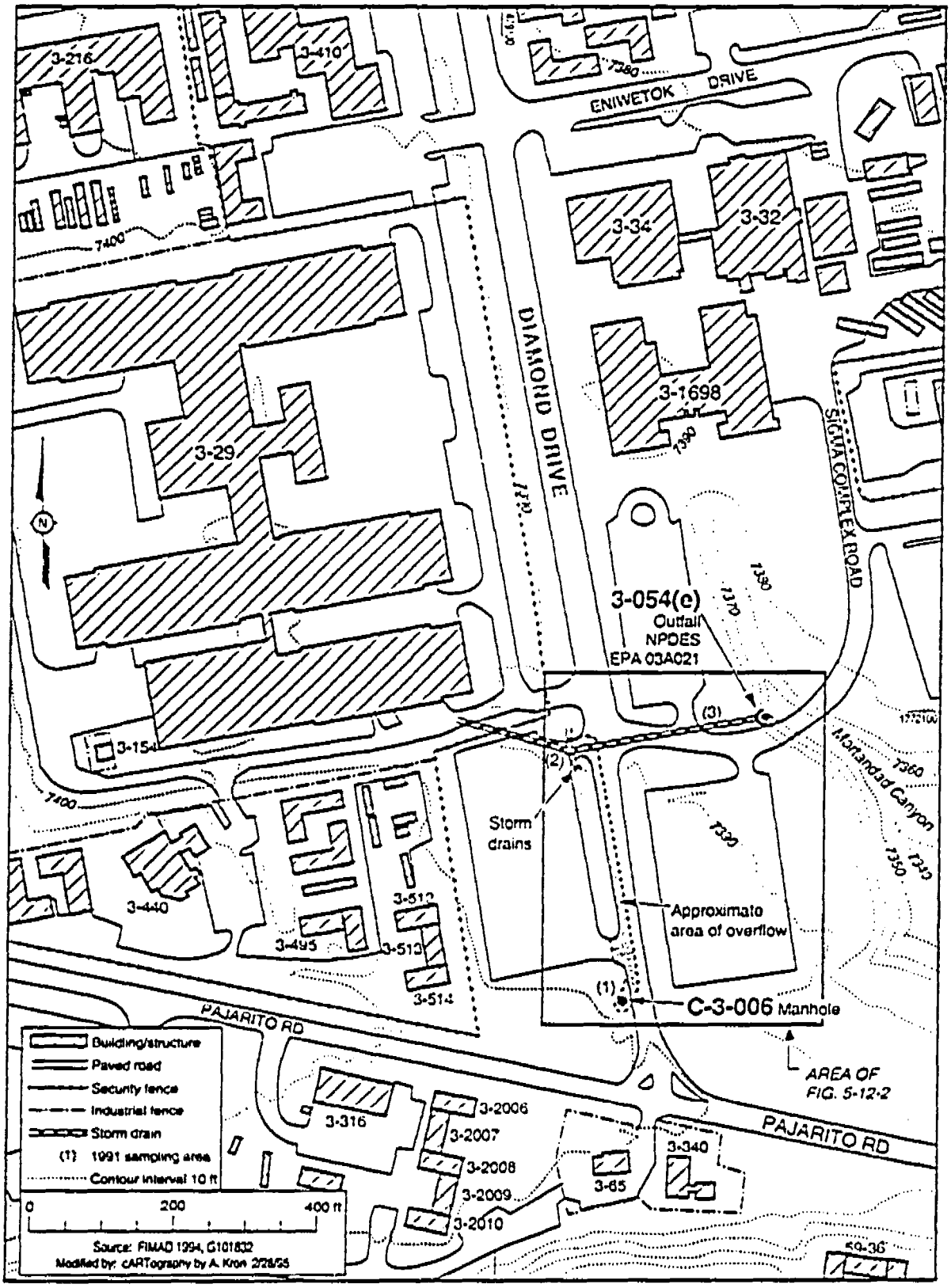


Fig. 5-12-1. Site location map of SWMU 3-054(e) and C-3-006.

In 1991 an interim action investigation was conducted prior to the construction of the Sanitary Wastewater System Consolidation (SWSC) line. Surface and subsurface soil samples were collected from three areas: 1) around C-3-006; 2) at the location of the new storm drain line on the east side of Diamond Drive; and 3) at a new manhole located in the old storm drain system before discharging into Mortandad Canyon (LANL 1991, 17-297) (Fig. 5-12-1). Soil samples were analyzed for toxicity characteristic leaching procedures (TCLP) metals, radionuclides, VOCs, SVOCs, and PCBs (LANL 1991, 17-297). All PCOCs were below current SALs except PCBs (LANL 1991, 17-297). PCBs were detected at four parts per million (ppm) in one sample at the location of the new storm drain line; the current SAL is 1 ppm (LANL 1991, 17-297). Since this interim action investigation was conducted, the area surrounding C-3-006 has been repaved.

5.12.2. Investigation Approach and Objectives

Investigation activities for this aggregate will focus on detecting the presence and nature of potentially contaminated soils at the outfall, SWMU 3-054(e). Because this outfall receives water from several potential sources of contamination in addition to the one-time discharge from the industrial drain manhole, PCOCs for this aggregate include metals, SVOCs, PCBs, and radionuclides, specifically plutonium, uranium, tritium, and cesium. It is unlikely that volatile constituents discharged via the outfall would accumulate in soils at the outfall because of aeration during transport through the storm drain. However, samples will be field screened for VOCs as described in Subsection 5.0.5 of this work plan.

Biased sampling will be conducted in soils in the outfall drainage area where contamination is most likely to exist. This biased approach is based on the known history of the PRSs and the PCOC and soil migration potential described in Subsection 5.0.3 of this work plan.

Six sample locations along the outfall drainage were selected based on existing topography and soil deposition. For the most part, the drainage channel is exposed tuff with only a few areas where sediment deposition has occurred. Sample spacing was chosen to bound the extent of contamination down the outfall and the number of samples was based on drainage topography, width, and soil deposition. Based on the factors listed above, the PCOCs identified for this site are most likely to have accumulated in the surface soil and at the soil-tuff interface; therefore, the biased samples will target these depths.

5.12.3 Sample Locations and Methods

Figure 5-12-2 identifies the sampling locations that will be used to determine the presence and nature of the PCOCs. The area directly between the outfall discharge and the confluence with the stream at the bottom of Mortandad Canyon will be sampled from three distinct depositional areas along the outfall but upgradient of the confluence. Two samples will be taken from separate locations within the first depositional area that is located approximately 10 ft downstream from the discharge pipe. A second depositional area is located approximately 15 ft downstream from the discharge pipe and two samples will be taken at separate locations within this area. The third depositional area is located approximately two feet upstream in the outfall flow path just before the confluence with the Mortandad Canyon stream. Two soil samples will be taken at separate locations within this depositional area.

The depth from the soil surface to the soil-tuff interface is expected to be no greater than 12 in. within each depositional area. Prior to sample collection at each location, the depth to the soil-tuff interface will be determined by driving a blunt, stainless steel rod into the ground.

Depending upon the amount and frequency of sediment deposition, PCOCs may be found at the soil/tuff interface as well as in the surface soil. At each sample location, samples will be field-screened with a photoionization detector and/or flame ionization detector for the presence of VOCs prior to homogenization. All VOC samples will be screened and collected as described in Subsection 5.0.5 of this work plan. In addition, all soil samples will be field screened for radioactivity using a hand-held gross gamma survey instrument as described in Subsection 5.0.5 of this work plan.

Soil samples will be collected from the 0 to 12-in. interval or to depth if the depth to the soil-tuff interface is 18 in. or less. If the depth to the soil-tuff interface is greater than 18 in., an additional sample will be collected as described above from the interval immediately above the soil-tuff interface. An aliquot of soil will be collected from the sample intervals prior to homogenization and submitted for laboratory analysis of SVOCs. The remainder of each sample interval will be homogenized and then submitted for laboratory analysis of Appendix VIII metals, PCBs, isotopic plutonium, isotopic uranium, gamma spectroscopy, and tritium.

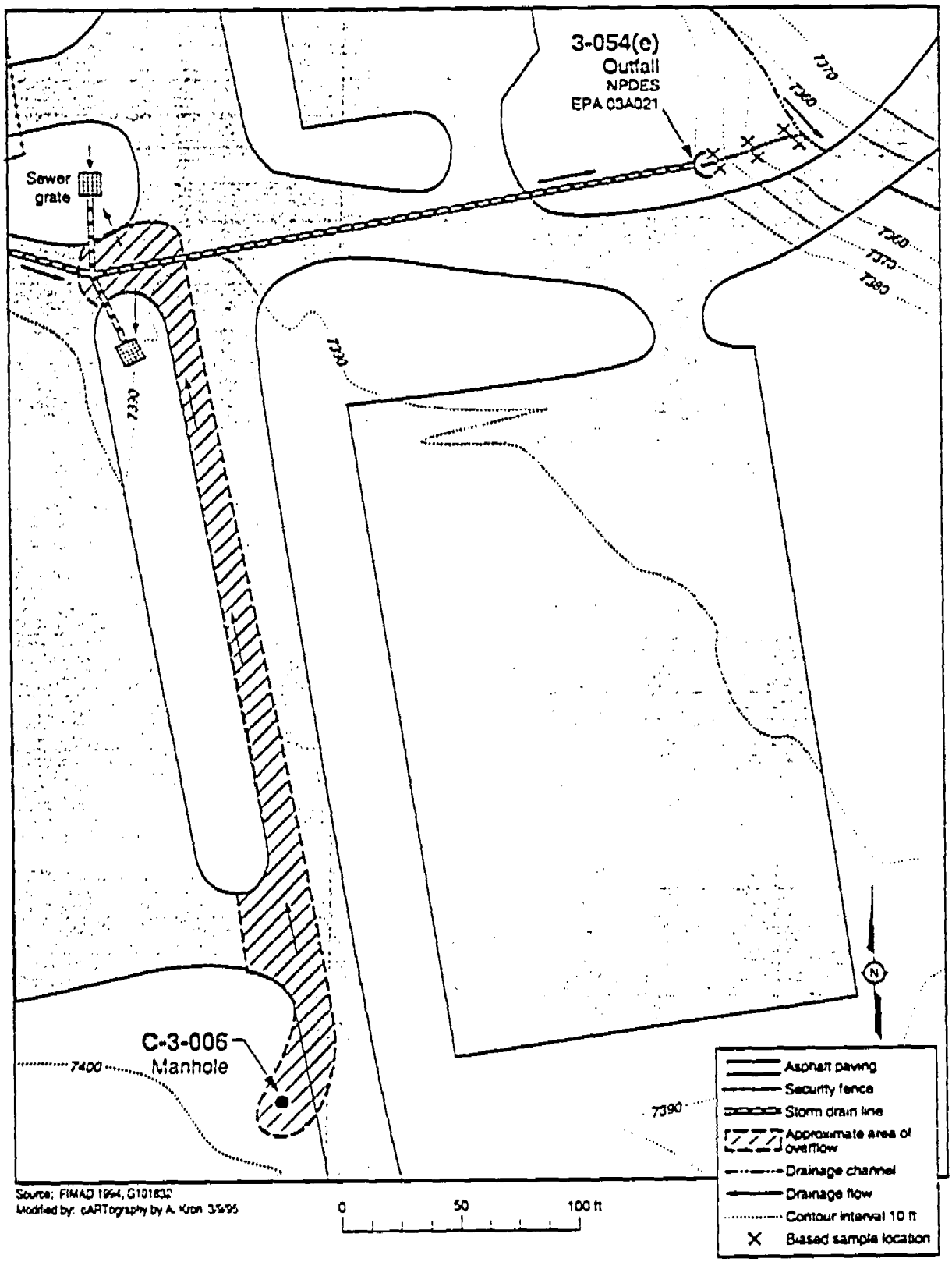
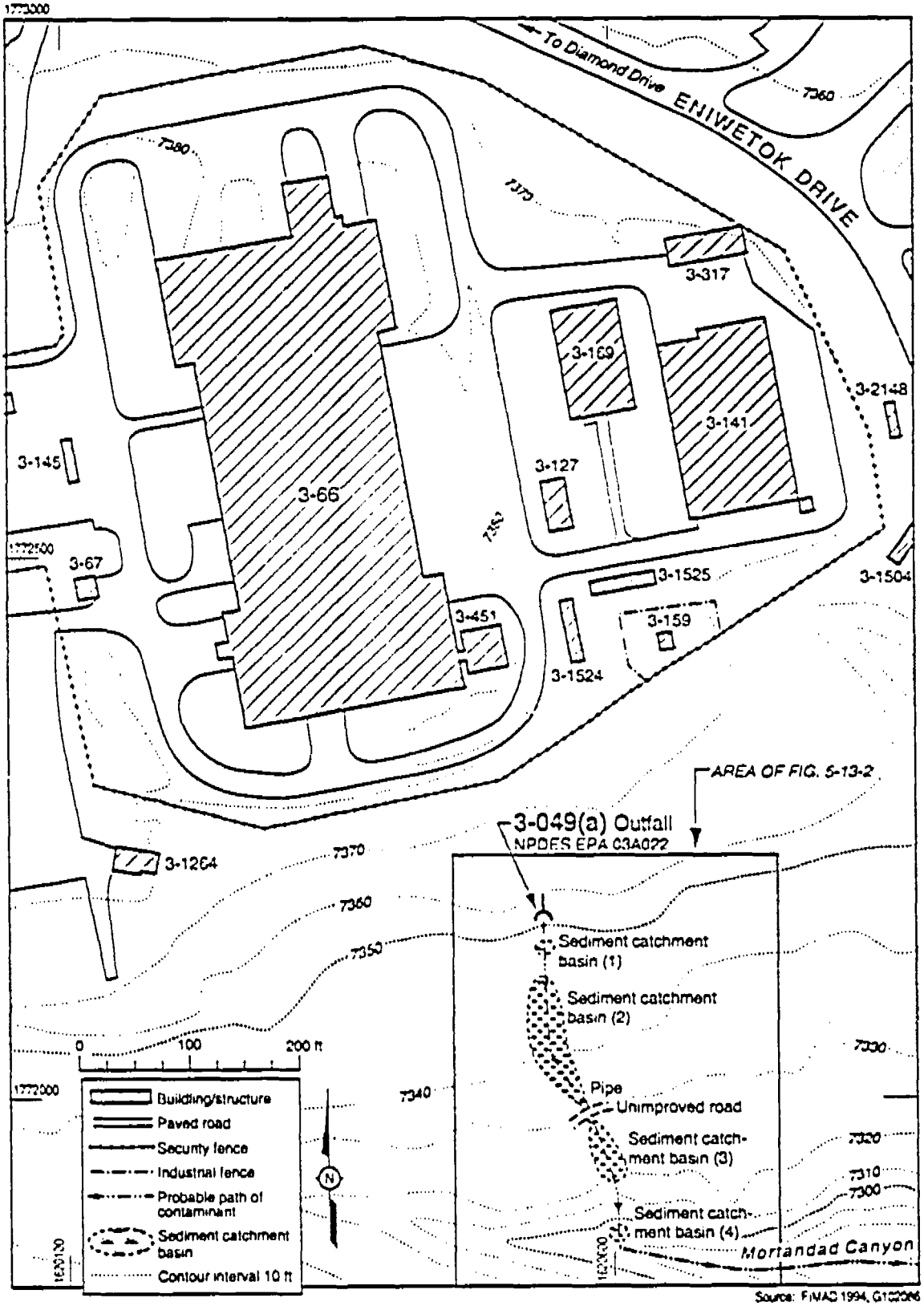


Fig. 5-12-2. Location of sample sites for SWMU 3-054(e) and C-3-006.

Surface samples will be collected using LANL-ER-SOP-06.09, R0, Spade and Scoop Method for Collection of Soil Samples to ensure adequate sample volume. The soil samples from the soil-tuff interface will be collected using LANL-ER-SOP-06.10, R0, Hand Auger and Thin-Wall Tube Sampler. A split-tube will be used to facilitate sample removal. The adjacent samples for VOC analysis will be collected using a hand auger fitted with a brass sleeve. Specific sample collection procedures that must be followed are discussed in Appendix D of Addendum 1.

5.12.4 Laboratory Analyses

All samples will be analyzed in the laboratory for constituents described above using appropriate EPA methodology. The number of anticipated samples, their locations, and the types of analyses are summarized in Table 5-12-1. One field duplicate, one collocated sample, and one rinse blank will be submitted for analyses as a maximum number of QC samples as determined using the guidelines in the site-specific QAPjP, Annex II, Note 2A. All samples will be prepared and shipped in accordance with LANL ER standard operating procedures for chain-of-custody and transportation as listed in Appendix D of Addendum 1.



Source: FINAL 1994, G100286
Modified by CARTography by A. Kron 3/6/95

Fig. 5-13-1. Site location map of SWMU 3-049(a).

the Laboratory monitors discharge quarterly and reports flow rate, total suspended solids, chlorine, pH, and total phosphorus.

5.13.2 Investigation Approach and Objectives

Investigation activities for SWMU 3-049(a) will focus on detecting the presence and nature of potential contamination in sediments and soils at the outfall and in the drainage area below the point of discharge. In the event that results of this investigation indicate contaminants are present in the fourth sediment catchment basin, additional sampling may need to be performed as part of a Phase II investigation to further evaluate the spatial distribution of PCOCs. Because treated cooling water may have contained chromates and rinse water may contain trace amounts of electroplating contaminants, the PCOCs for this SWMU include Appendix VIII metals, cyanide, and depleted uranium.

Biased sampling will be conducted in sediments and soils along the drainage where contamination is most likely to exist (Fig. 5-13-2). Sampling locations will be based on the known history of the SWMU and the PCOC and soil migration potential as discussed in Subsection 5.0.5.

Biased samples will be collected from the media in obvious accumulation areas within the four sediment catchment basins. The number of samples and locations were selected based on drainage topography and dimensions and media deposition. Additionally, sample locations were selected at sites along the drainage to bound the lateral extent of contamination. In the event that the results of this investigation indicate contaminants are present at the soil-tuff interface, additional sampling may be performed during a Phase II investigation to further evaluate the vertical distribution of PCOCs.

5.13.3 Sample Locations and Methods

Figure 5-13-2 identifies the eight sampling locations that will be used to identify the presence and nature of the PCOCs. Sediment and soil samples will be collected from two locations within each of the four sediment catchment basins.

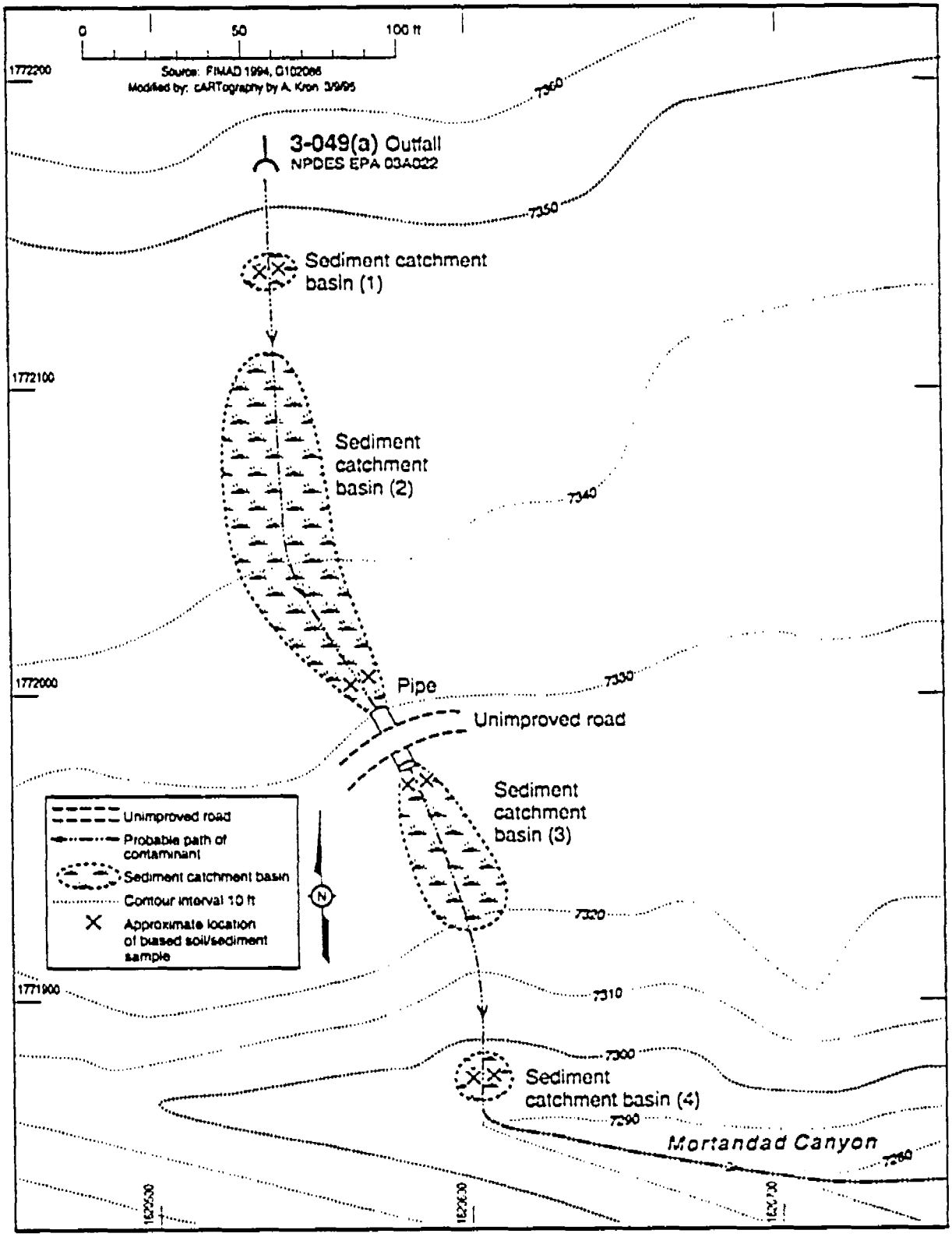


Fig. 5-13-2. Location of sampling sites for SWMU 3-049(a).

Because seasonal variations influence the size of the sediment catchment basins, specific sample locations will be selected based on field observations.

All samples will be screened and collected for VOCs as described in Subsection 5.0.5. The confirmatory VOC samples for this site will be collected from the first sediment catchment basin and will consist of two water and two sediment samples collected from the six-inch interval immediately above the soil-tuff interface. The samples will be placed in appropriate glass containers and submitted for analysis at a fixed laboratory. All samples will be screened for radiological constituents as described in Subsection 5.0.5.

The depth of sediment within the first sediment catchment basin is expected to be about six inches. The depth to the soil-tuff interface in the second, third, and fourth sediment catchment basins is expected to be no greater than one foot. Prior to sample collection in any of the sediment catchment basins, depth to the soil-tuff interface will be determined at each sample location by driving a blunt, stainless steel rod into the ground.

As previously noted, the media where PCOCs have most likely accumulated are sediments, surface soil, and at the soil-tuff interface. These may all fall within the 0 to 12 in. interval. Soil samples in the first basin will be collected from the surface to the soil-tuff interface. If the depth to the soil-tuff interface is greater than 12 in., one sample will also be collected from the 12-in. interval immediately above the soil-tuff interface.

Soil samples in the second, third, and fourth catchment basins will be collected from the 0 to 12-in. interval or to depth if the depth to the soil-tuff interface is 18 in. or less. If the depth to the soil-tuff interface is greater than 18 in., an additional sample will be collected as described above from the interval immediately above the soil-tuff interface. All samples will be homogenized prior to submittal for analysis of Appendix VIII metals and cyanide. Four composite samples, one from each of the four sediment catchment basins, will also be analyzed for isotopic uranium.

The sediment samples will be collected using LANL-ER-SOP-06.14, R0, Sediment Material Collection. Soil samples will be collected using LANL-ER-SOP-06.09, R0, Spade and Scoop Method for Collection of Soil Samples. Additionally,

the adjacent samples for VOC analysis will be collected using the LANL-ER-SOP-06.10, R0, Hand Auger and Thin-Wall Tube Sampler if amenable to site conditions. Water samples will be collected using LANL-ER-SOP-06.03, R0, Sampling for Volatile Organics. A split-tube fitted with a brass sleeve will be used during soil sample collection to facilitate sample removal if amenable to site conditions. Specific sample collection procedures that must be followed are discussed in Appendix D of Addendum 1.

5.13.4 Laboratory Analyses

Sediment and soil samples will be analyzed in the laboratory for Appendix VIII metals, cyanide, total uranium, and VOCs using appropriate EPA methodology. The number of anticipated samples, their locations, and the types of analyses are summarized in Table 5-13-1. One rinsate blank and one field duplicate will be submitted for analyses as a maximum number of QC samples as determined using the guidelines in the site-specific QAPjP, Annex II, Note 2A. All samples will be prepared and shipped in accordance with LANL ER standard operating procedures for chain-of-custody and transportation listed in Appendix D.

TABLE 5-13-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE 1 SAMPLING PLAN SUMMARY OF SWMU 3-049(a) TA-3-66 OUTFALL

SAMPLE DESCRIPTION					FIELD SCREENING			FIXED LABORATORY ANALYSIS			
								RADIO-NUC-LIDES	OR-GANICS	METALS	MISC
SAMPLING LOCATION DESCRIPTION	NO. OF SAMPLE LOCATIONS	SAMPLE DEPTH (IN.)	TOTAL NO. OF SAMPLES	SAMPLE I.D. NUMBER	RADIATION SCREENING[a]	ORGANIC VAPOR SCREENING (PID/FID)	RAD VAN ANALYSIS[b]	ISOTOPIC URANIUM	VOCs (SW 8240)	APPENDIX VIII METALS (SW 6010, 7000)	CYANIDE (SW 9010, 9012)
Sediment catchment basin 1	2	0 - s/t[c]	2		2	2	2	1		2	2
Sediment catchment basin 2	2	0 - 12	2		2	2	2	1		2	2
		s/t[c]	2		2	2	2			2	2
Sediment catchment basin 3	2	0 - 12	2		2	2	2	1		2	2
		s/t	2		2	2	2			2	2
Sediment catchment basin 4	2	0 - 12	2		2	2	2	1		2	2
		s/t	2		2	2	2			2	2
QC SAMPLES[d]											
Field Duplicate	1	TBD[e]	1		1	1	1	1		1	1
Rinsate Blank	NA[f]		1					1		1	1
Confirmatory samples (sediment)	2	TBD	2		2	2	2		2[g]		
Confirmatory samples (water)	2	NA	2		2	2	2		2[g]		
TOTALS	13		20		19	19	19	6	4	16	16

[d] QC samples are determined using guidelines outlined in the site-specific QAPjP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.

[a] Gross alpha, beta, and gamma using field instrumentation.

[b] Gross alpha, beta, and gamma using mobile laboratory instrumentation.

[g] Represents minimum number of confirmation samples to be submitted for VOCs and radiological constituents based on field screening results. Actual number may vary.

[c] s/t = soil-tuff interface (12-in. interval above interface).

[f] NA = Not applicable.

[e] TBD = To be determined in the field.

SWMU 3-021

5.14 Former Outfall Near the Compressed Gas Facility

5.14.1 Description and History

SWMU 3-021 is a former outfall located approximately 60 ft north of the north exterior wall of TA-3-170, the compressed gas facility (Fig. 5-14-1). The exact location and dimensions of the outfall area are unknown because regrading and construction work for TA-3-1650, the compressed gas cylinder storage building, has resulted in placement of 5 to 10 ft of fill material over the former outfall area. From approximately 1964 to 1976 the outfall discharged caustic wash and rinse water from compressed gas cylinder cleaning operations in TA-3-170. The SWMU 3-021 outfall has not been used since 1976 when cylinder washing and painting responsibilities were assumed by the compressed gas suppliers (LANL 1993, 17-908; LANL 1993, 17-904).

SWMU 3-021 received wash and rinse wastewater from gas cylinder cleaning operations that occurred in TA-3-170 (LANL 1993, 17-908; LANL 1993, 17-906; LANL 1993, 17-905; LANL 1993, 17-904). The gas cylinders were washed and stripped of paint using a caustic soda solution before being repainted. No documentation is available on the chemicals and processes associated with the SWMU 3-021 outfall (LANL 1993, 17-907; LANL 1993, 17-905; LANL 1993, 17-904). However, paint used during the 1960s and 1970s typically contained heavy metals, such as lead. The washing and stripping operation occurred in a below-floor-grade pit in the northern portion of TA-3-170 (LANL 1993, 17-904; LANL 1993, 17-908; LANL 1993, 17-906; LANL 1993, 17-905). Any exterior dirt, oil, and grease was washed from the cylinders in the adjacent parking lot prior to being washed and stripped with caustic soda in TA-3-170 (LANL 1993, 17-906). Before being transported to TA-3-170, the cylinders were screened for radioactive contamination and decontaminated at the user's facilities (LANL 1993, 17-906).

Based on a field examination of the outfall exit pipe from the north exterior wall of TA-3-170 and interviews with previous site workers, a 2-in. diameter iron outfall pipe in an open ditch carried the caustic wash and rinse water due north (LANL 1993, 17-905). Discharge from the end of the outfall pipe was then directed into a northeast-trending surface ditch that carried the wastewater approximately 180 ft to the main north-south drainage ditch. The discharge to the north-south drainage ditch is designated by the NPDES number EPA 04A094 (Fig. 5-14-2).

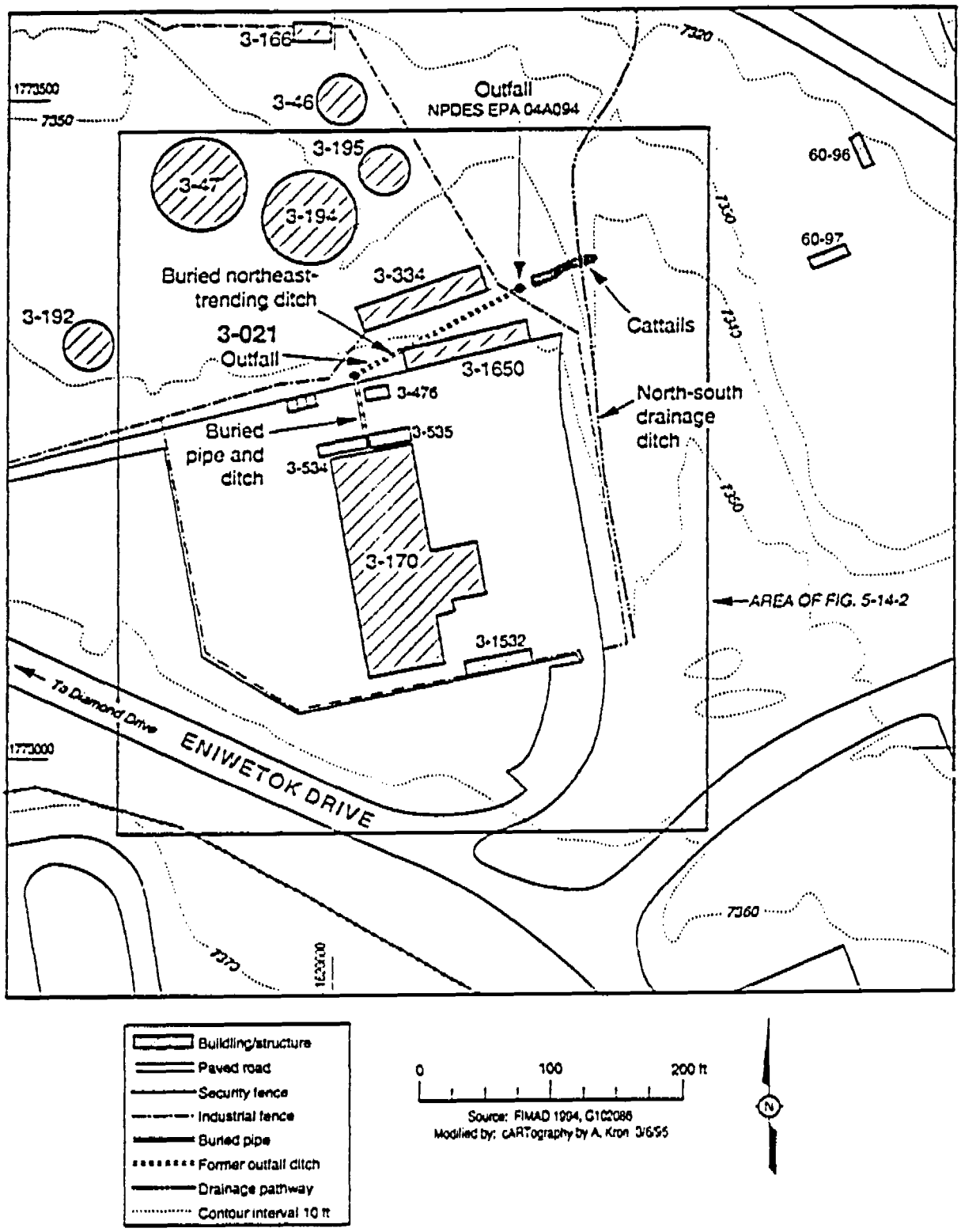


Fig. 5-14-1. Site location map of SWMU 3-021.

NPDES EPA 04A094 is permitted to discharge non-contact cooling water from TA-3-170 via the main north-south drainage. Review of aerial photographs indicates the presence of the shallow northeast-trending ditch constructed in Bandelier Tuff (LANL 1977, ER 17859). This area is presently covered with an unknown thickness of fill material. A significant amount of runoff from paved areas drains northward and enters this fill area approximately 40 ft east of the SWMU 3-021 outfall ditch. The SWMU 3-021 outfall and outfall ditch are now covered with approximately 5 to 10 ft of fill material and asphalt paving.

5.14.2 Investigation Approach and Objectives

The objective of this investigation is to provide information regarding the nature and extent of contamination associated with SWMU 3-021. Heavy metal precipitates from paint chips suspended in the wastewater are likely contaminants. It is possible that the caustic nature of the wastewater caused metals, such as lead and chromium, to precipitate as oxides and hydroxides. Therefore, the primary PCOCs are Appendix VIII metals. Additionally, SVOCs are PCOCs because they are constituents of enamel-based paints that may have been removed from the compressed gas cylinders. VOCs are not PCOCs, because volatilization during transport makes it unlikely that any volatile constituents would accumulate in soils. However, samples will be field screened and collected if necessary for VOCs as described in Subsection 5.0.5 of this work plan.

Soils that may be contaminated are now buried by the fill material and/or asphalt that were placed during construction of TA-3-1650. Potential contamination from washing compressed gas cylinders is most likely contained in the soil surrounding the SWMU 3-021 outfall pipe and ditch and the northeast-trending ditch. The pipe fittings on the north wall of TA-3-170 and the NPDES outfall bound the area to be investigated. Therefore, the investigation approach for SWMU 3-021 is to first locate the former SWMU 3-021 outfall ditch and northeast-trending ditch, and then conduct subsurface sampling and analysis of these former ditches to assess the presence and nature of contamination.

A biased sampling approach will be used to investigate SWMU 3-021 and will target areas most likely to be contaminated based on historical information and transport processes in the outfall area. Sample locations were selected along the drainage to bound the lateral extent of contamination. The PCOCs identified for

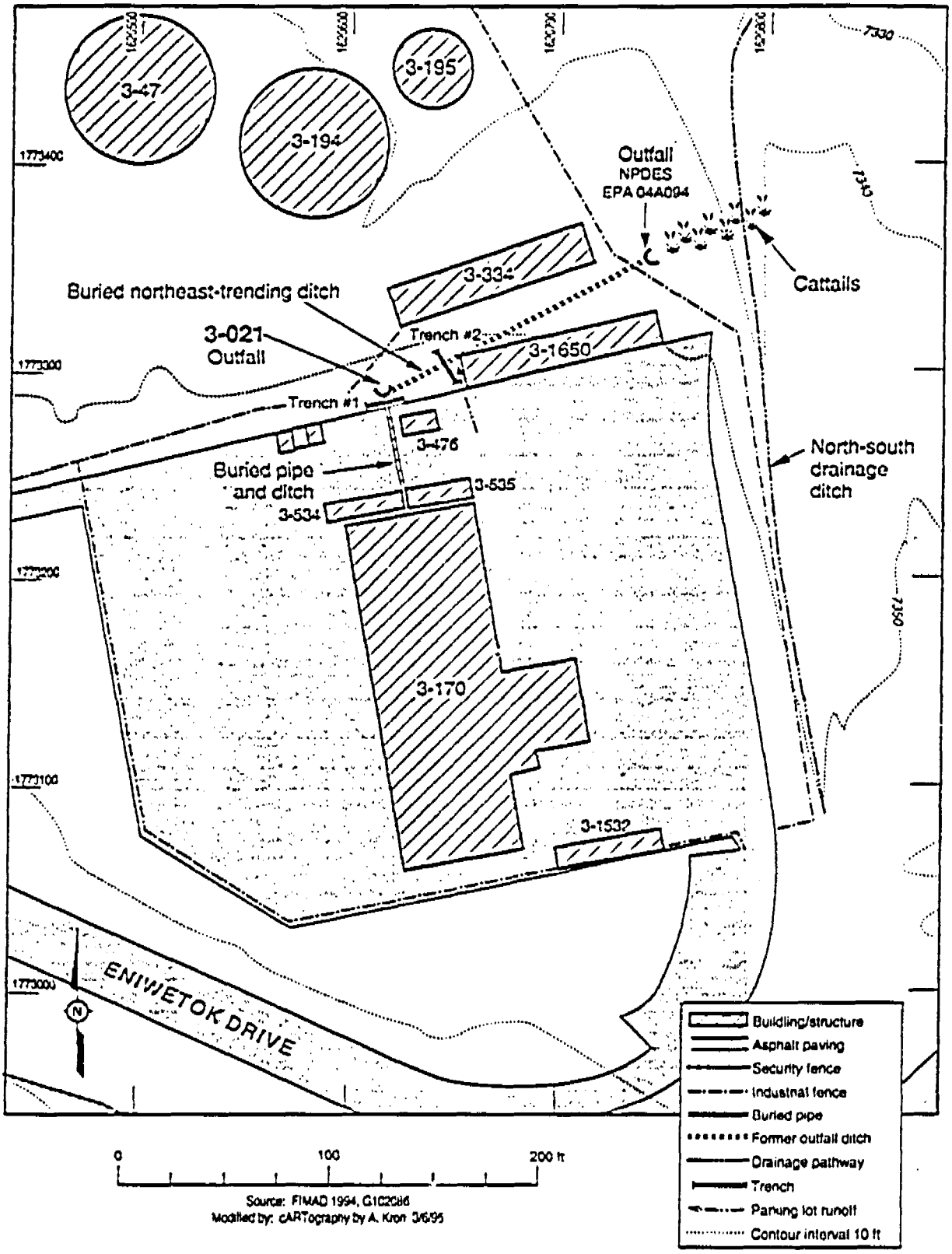


Fig. 5-14-2. Location of sampling sites for SWMU 3-021.

this site are most likely to have accumulated in sediments or at the soil-tuff interface, assuming that the drainage ditches were not dug into the tuff. Therefore, biased samples will target these media and depths.

5.14.3 Sample Locations and Methods

The exact location of the former SWMU 3-021 ditch is not precisely known because it is now buried beneath 5 to 10 ft of fill and several layers of asphalt. However, as previously stated, the outfall ditch extended to the north, perpendicular to the north wall of TA-3-170 where there are pipe fittings that were associated with the 2-inch diameter iron outfall pipe. It is not known if the outfall pipe itself was removed or left in place. These pipe fittings were sealed when the system was decommissioned. Six samples will be collected from the two trenches. Trench 1 will be excavated near the northern edge of the asphalted fill area perpendicular to the probable location of the outfall ditch (Fig. 5-14-2). Once the pipe has been located, biased samples will be collected from three locations immediately beneath and spaced uniformly across the trench. Sample biasing will be based on evidence of soil staining and the presence of paint chips or other anomalies. If the pipe is no longer present, three biased samples will be collected across the drainage ditch, which may be discerned from field observations such as differences between native soil and fill material. Samples will be collected from the one-foot interval below the fill-soil interface. An aliquot of soil will be collected from the sample intervals prior to homogenization and submitted for laboratory analysis of SVOCs. The remainder of each sample interval will be homogenized and then submitted for laboratory analysis of Appendix VIII metals.

After approximating the location of the former SWMU 3-021 outfall, the location of the former northeast-trending ditch leading to the NPDES discharge area can be extrapolated. The second trench (trench 2) will be located along the northeast-trending ditch approximately 5 to 10 ft upgradient of the point at which parking lot runoff enters the current drainage. As described above for the SWMU 3-021 outfall ditch, biased samples will be collected from three locations in the trench based on field observations. Site history indicates that this ditch was excavated into Bandelier Tuff and subsequently filled with fill material during construction of building TA-3-1650. Therefore, samples will be collected from the one-foot interval below the fill-tuff interface. An aliquot of soil will be collected from the sample intervals prior to homogenization and submitted for laboratory analysis of

SVOCs. The remainder of each sample interval will be homogenized and then submitted for laboratory analysis of Appendix VIII metals.

All samples will be field screened and collected for VOCs. In the absence of field-detected VOCs, a confirmatory sample will be collected at random from each trench as described in Subsection 5.0.5. All samples will also be field screened for radiological constituents as described in Subsection 5.0.5.

Trenches will be excavated using LANL-ER-SOP-03.10, R0, Trenching and Logging. Soil and tuff samples will collected using LANL-ER-SOP-06.10, R0 Hand Auger and Thin-Wall Tube Sampler. Split-tubes will be used to facilitate sample removal. Adjacent samples for VOC analysis will be collected using a hand auger fitted with a brass sleeve. Specific procedures to be followed in the field for sample collection are discussed in Appendix D of Addendum 1.

5.14.4 Laboratory Analyses

All soil and tuff samples will be laboratory analyzed for Appendix VIII metals and SVOCs using appropriate EPA methodology. The number of anticipated samples, their locations, and the types of analyses are summarized in Table 5-14-1. One field duplicate will be submitted for analyses as a maximum number of QC samples as determined using the guidelines in the site-specific QAPjP, Annex II, Note 2A of this work plan. All samples will be prepared and shipped in accordance with LANL ER standard operating procedures for chain-of-custody and transportation as listed in Appendix D of Addendum 1.

TABLE 5-14-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE 1 SAMPLING PLAN SUMMARY OF SWMU 3-021 COMPRESSED GAS FACILITY OUTFALL

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LABORATORY ANALYSIS		
								ORGANICS		METALS
SAMPLING LOCATION DESCRIPTION	NO. OF SAMPLE LOCATIONS	SAMPLE DEPTH (IN.)	TOTAL NO. OF SAMPLES	SAMPLE I.D. NUMBER	RADIATION SCREENING[2]	ORGANIC VAPOR SCREENING (PID/FID)	RAD VAN ANALYSIS[3]	VOCs (SW 8240)	SVOCs (SW 8270)	APPENDIX VIII METALS (SW 6010, 7000)
Outfall pipe trench										
Trench 1	3	12-in. below f/s[5]	3		3	3	3		3	3
Northeast-trending ditch										
Trench 2	3	12-in. below f/t[6]	3		3	3	3		3	3
QC SAMPLES[1]										
Field Duplicate	1	TBD	1		1	1	1		1	1
Confirmatory samples	2	TBD	2		2	2	2	2[4]		
TOTALS	9		9		9	9	9	2	7	7

[1]QC samples are determined using guidelines outlined in the site-specific QAPJP, Annex II, note 2A of this workplan. Location determined by the Field Team Leader.

[2]Gross alpha, beta, and gamma using field instrumentation.

[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.

[4]Represents minimum number of confirmation samples to be submitted for VOCs based on field screening results. Actual number may vary.

[5]f/s = fill/soil interface.

[6]f/t = fill/tuff interface.

NA = Not applicable.

TBD = To be determined in field.

SWMU 3-052(b) : SWMU 3-056(k) and

5.15 Storm Drains and Drum Storage North of TA-3-66

5.15.1. Description and History

The PRSs included in this aggregate are SWMU 3-056(k) and SWMU 3-052(b). These SWMUs can be evaluated using one sampling and analysis plan because SWMU 3-056(k), the outside storage area located on the north side of TA-3-66 (Sigma Building), is a potential upgradient source to the storm drain system designated SWMU 3-052(b) (Fig. 5-15-1).

SWMU 3-056(k) is identified as an outside storage area, including the loading dock, situated on the north side of TA-3-66. During a 1993 site visit to SWMU 3-056(k), it was noted that a 55-gal. drum containing depleted uranium chips in diesel fuel was stored on the loading dock, under a tarp, within secondary containment. Drums containing vacuum pump oil mixed with vermiculite were also staged at this location prior to transport to TA-54. Oil from the vacuum pumps was suspected of contamination from depleted uranium. Staining was observed on the asphalt where the oil/vermiculite drums were stored. It was also reported that janitors dumped wastewater from floor cleaning (which included cleanup of oil spills) off the dock. As a result of this practice, a voluntary cleanup action was performed. Contamination was fixed in place by painting the dock, and a two foot strip of asphalt along the western portion of the dock was replaced. The soil west of the dock was screened for radioactive contamination but nothing was detected (Heskett 1995, 17-1205).

The drum storage area north of TA-3-66 also contains drummed, spent graphite molds that were used to form depleted uranium components (Heskett 1995, 17-1205). Surface runoff flows across the surrounding area into the storm drain system at two locations. This storm drain system, identified as SWMU 3-052(b), is located approximately 20 ft both north and west of TA-3-66. It consists of three sections of pipe (two sections are corrugated metal and one is vitrified clay) and can be accessed at five locations shown on Fig. 5-15-1. The single storm drain located on the northwest side of TA-3-66 discharges to a low-lying grassy area. The storm drain system on the northeast side of TA-3-66 discharges to a storm drain outlet located just north of Eniwetok Drive (Fig. 5-15-1).

In addition, three documented radiological material releases may have contributed contamination to SWMU 3-056(k) and may have impacted SWMU

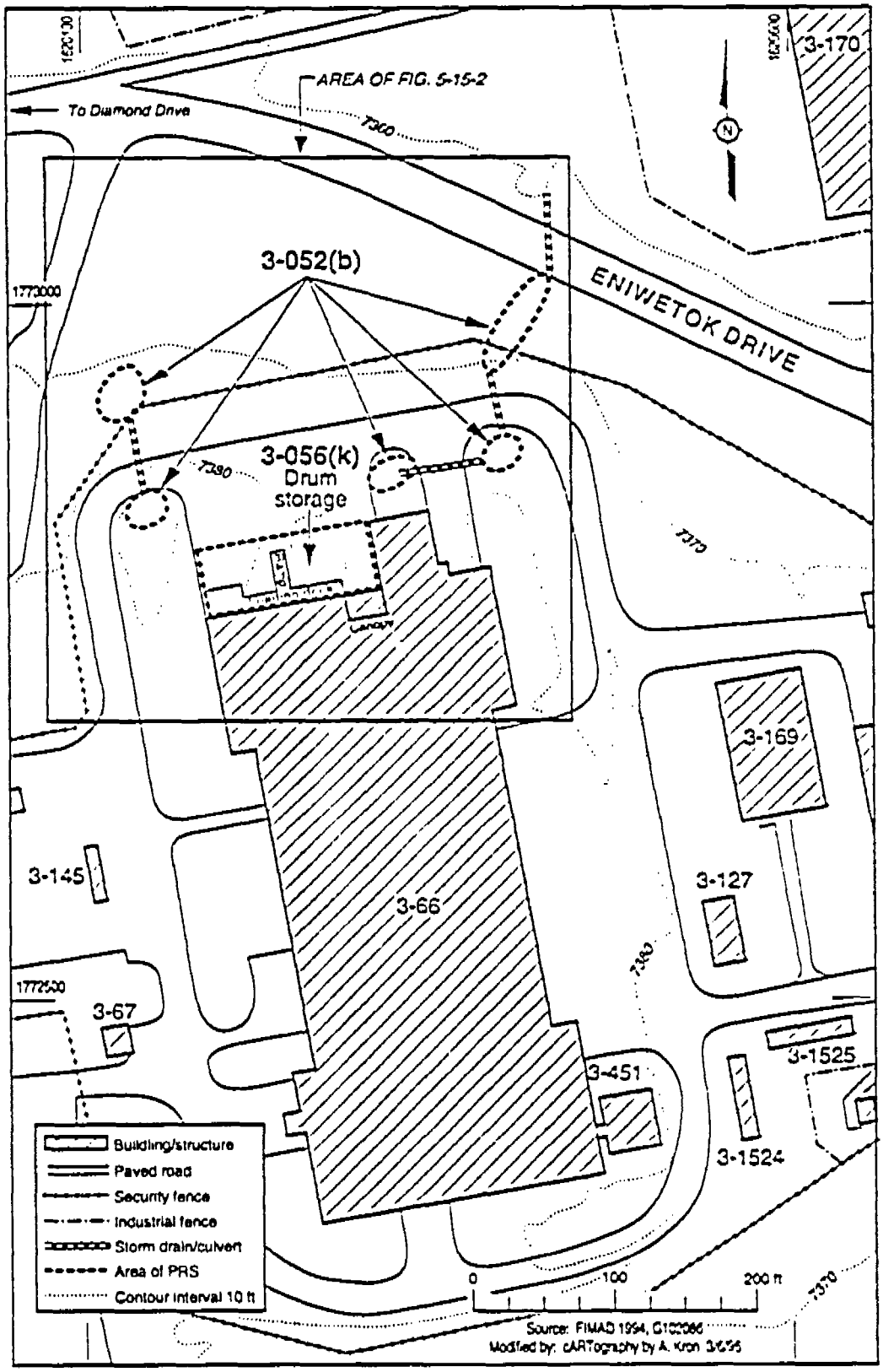


Fig. 5-15-1. Location of sample sites for SWMUs 3-056(k) and 3-052(b).

3-052(b). Two of these releases are associated with the TA-3-66 foundry crucible-cleaning operation. In past years, this operation utilized a centrifugal separator and tubular bag shaker system to collect graphite and depleted uranium oxide dust. The first release is believed to have occurred in 1989 after changeout of the drums used to collect dust from the separator/shaker system. After changeout, the gate valves to the drums were not reopened which resulted in dust accumulating in the separator housings and leaking to the surrounding environment. Rain carried the released material to the adjacent concrete dock (LANL 1991, 17-1202). This release is believed to be the cause of above-background radiation levels detected in a limited area during a radiation survey conducted in 1994 before the planned move of equipment from an area near the SWMU 3-056(k) loading dock (LANL 1994, 17-1208). A second release occurred in 1991 when the filter bag in the graphite shaker failed and graphite dust escaped the shaker system. A radiological survey of the impacted area was performed; however, no detectable contamination was found (LANL 1991, 17-1202). A third release that may have affected SWMU 3-056(k) occurred on June 29, 1992, when a water leak from a broken steam pipe was discovered in the TA-3-66 foundry. This leak caused water to spill through a radiological controlled area and out the back loading dock of SWMU 3-056(k). Three water samples were taken at the time of the spill, with only one sample, from a controlled area, revealing radiation levels above SALs (Clements 1992, 17-1201).

5.15.2. Investigation Approach and Objectives

Based on known releases from the TA-3-66 area, PCOCs for these SWMUs include Appendix VIII metals and depleted uranium. Sampling activities for SWMU 3-052(b) will focus on detecting the presence and nature of potential contamination in soils associated with the storm drain. Biased sampling strategies will be used for SWMU 3-052(b) to select five locations where access to the storm drain system allows for collection of soil samples. For SWMU 3-056(k); sampling will focus on detecting the presence and nature of potential contamination in the soil and asphalt around the drum storage area. No obvious spill areas exist at SWMU 3-056(k); therefore, random sampling will be used to provide coverage of the entire drum storage area, increasing the likelihood that contaminated areas will be identified.

Areas most likely to be contaminated, based on historical information, current observations of site use, physical and chemical characteristics of the soil, and the PCOC migration potential as described in Subsection 5.0.3 of this work plan will be selected as biased sampling sites.

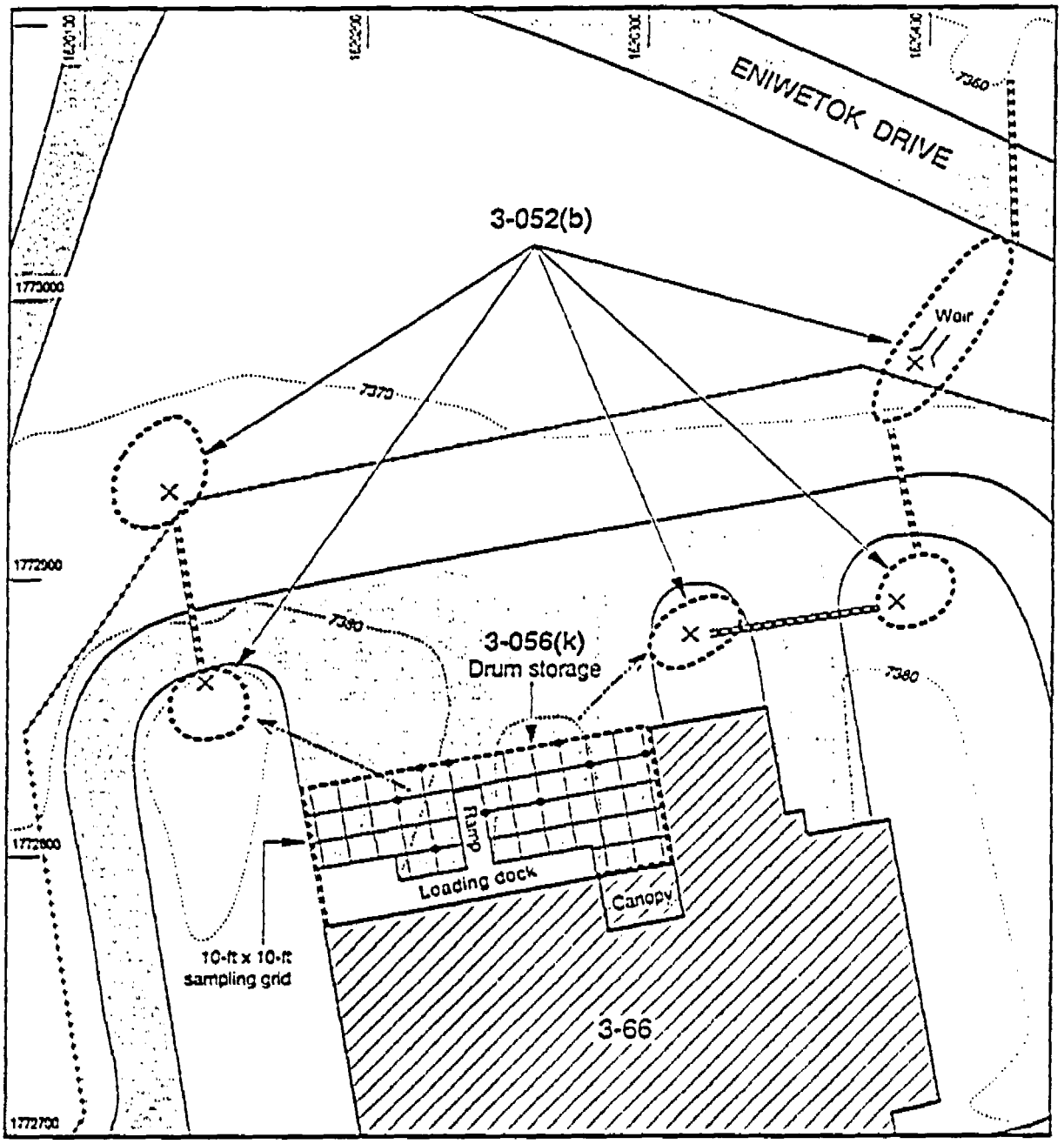
5.15.3. Sample Locations and Methods

Biased soil samples will be collected at the five access points to the storm drain of SWMU 3-052(b) shown on Fig. 5-15-2; one sample site will be located at each access point. Selection of sampling points will be based on soil deposition at the access points.

Random samples at SWMU 3-056(k) will be selected from a 10-ft by 10-ft sampling grid on a 50-ft wide by 125-ft long sampling area that abuts the loading dock on the north side. A site reconnaissance will be conducted to verify sites selected, followed by a geodetic survey of those grid nodes selected for sampling. Based on the likely types and volume of spills and/or releases in the area, it will be assumed that 25% of the sample grid area may be contaminated. If 25% of the sample grid is assumed to be contaminated and a 90% level of confidence is desired for detection of contamination, 9 sample points will be randomly selected at grid nodes using the equation discussed in Section 5.0.4. All sampling sites are shown schematically on Fig. 5-15-2.

For both biased and random sample locations, soil samples will be screened continuously in 12-in. intervals from the surface down to the clay-rich horizon, or to the soil-tuff interface if no clay-rich horizon is found. Each sample interval will be screened and collected for VOCs as described in Subsection 5.0.5. Each sample will also be screened for radionuclides as described in Subsection 5.0.5.

Because the drum storage area is covered with asphalt, the asphalt and the underlying base course will be removed prior to soil sample collection. Asphalt samples will not be submitted for Appendix VIII metals analyses because it is unlikely that the metals would have adsorbed to the asphalt surface. Soil samples will be collected from the 0 to 12-in. interval and from the 12-in. interval immediately above the clay-rich horizon, or the soil-tuff interface if no clay-rich horizon is found. Soil samples from each depth will be homogenized and then submitted for laboratory analysis of Appendix VIII metals and isotopic uranium.



Building/structure
Asphalt paving
Security fence
Storm drain/culvert
Area of PRS
Probable path of contaminant
Contour interval 10 ft

Approximate biased sample location
Approximate random sample location

0 50 100 ft

Source: FIMAD 1994, G102086
Modified by: cARTography by A. Kron 3/5/95

Fig. 5-15-2. Location of sample sites for SWMUs 3-056(k) and 3-052(b).

Asphalt will be sampled using the LANL-ER-SOP-06.28, R0, Chip Sampling of Porous Surfaces. Soil samples from the 0 to 12-in. depth interval and from the 12-in. interval immediately above the clay-rich horizon or the soil-tuff interface as described above will be collected using LANL-ER-SOP-06.09, R0, Spade and Scoop Method for Collection of Soil Samples. Soil samples collected from the interval above the clay-rich horizon or the soil-tuff interface will use LANL-ER-SOP-06.10, R0, Hand Auger and Thin-Wall Tube Sampler and a split tube will be used to facilitate soil sample removal. Adjacent samples for VOC analysis will be collected using a hand auger fitted with a brass sleeve. Specific sample collection procedures that must be followed are discussed in Appendix D of Addendum 1.

5.15.3. Laboratory Analyses

Asphalt and soil samples will be analyzed in the laboratory for the constituents described above using appropriate EPA methodology. The number of anticipated samples, their locations, and the types of analyses are summarized in Table 5-15-1. One field duplicate and one field located sample will be submitted as the maximum number of QC samples determined using the guidelines in the site specific QAPjP, Annex II, Note 2A of this work plan. All samples will be prepared and shipped in accordance with LANL ER standard operating procedures for chain-of-custody and transportation as listed in Appendix D of Addendum 1.

TABLE 5-15-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE 1 SAMPLING PLAN SUMMARY OF SWMU 3-052(b) and 3-056(k), STORM DRAIN SYSTEM AND STORAGE AREA

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LABORATORY ANALYSIS		
								RADIO-NUC-LIDES	ORGANICS	METALS
SAMPLING LOCATION DESCRIPTION	NO. OF SAMPLE LOCATIONS	SAMPLE DEPTH (IN.)	TOTAL NO. OF SAMPLES	SAMPLE I.D. NUMBER	RADIATION SCREENING[1]	ORGANIC VAPOR SCREENING (PID/FID)	RAD VAN ANALYSIS[2]	ISOTOPIC URANIUM	VOCs (SW 8240)	APPENDIX VIII METALS (SW 6010, 7000)
SWMU 3-052(b)										
Biased sampling	5	0 - 12	5		5	5	5	5		5
		s/t[3]	5		5	5	5	5		5
SWMU 3-056(k)										
Random sampling										
10-ft x 10-ft grid	9	asphalt	9		9	9	9	9		
		0 - 12 (soil)	9		9	9	9	9		9
		s/t	9		9	9	9	9		9
QC SAMPLES[1]										
Field Collocated	1	TBD	1		1	1	1	1		1
Field Duplicate	1	TBD	1		1	1	1	1		1
Confirmatory samples	2	TBD	2		2	2	2		2[4]	
TOTALS	18		41		41	41	41	39	2	30

[1] QC samples are determined using guidelines outlined in the site-specific QAPjP, Annex II, Note 2A of this work plan. Specific locations will be determined by the Field Team Leader.

[2] Gross alpha, beta, and gamma using field instrumentation.

[2] Gross alpha, beta, and gamma using mobile laboratory instrumentation.

[4] Represents minimum number of confirmatory samples to be submitted for VOCs based on field screening results. Actual number may vary.

[3] s/t = soil/tuff interface (12-in. interval above interface).

TBD = To be determined in the field.

5.16 SWMU Shops Outfall

5.16.1 Description and History

The PRSs in this aggregate include two storm drains, SWMU 3-052(a) and 3-052(e), that discharge to a TA-3 storm sewer and continue to the NPDES permitted outfall for cooling tower blow-down/effluent and noncontact cooling water at SWMU 3-054(b) (Fig. 5-16-1). Because the two storm drains are potential sources of contaminants for outfall SWMU 3-054(b), these SWMUs can be evaluated using one sampling and analysis plan.

SWMU 3-054(b) is the outfall area of a TA-3 storm sewer that eventually discharges to Twomile Canyon. The discharge area, located approximately 70 ft west of building TA-3-1538, is filled with 1.5 to 2 ft of sediment and is covered by vegetation consisting of grasses and cattails. Effluent from the outfall has formed a gently sloping drainage channel of widths ranging from 10 to 15 ft that flows south for approximately 100 ft to a perimeter road. A 10-ft long weir is located approximately 25 ft downgradient of the outfall pipe. A drainage swale that collects runoff from both paved and unpaved areas surrounding TA-3-1538 enters the drainage channel from the east, approximately 25 ft downgradient of the outfall pipe. Storm water runoff from the perimeter road also enters the drainage area at this location. The water in the drainage area is routed under the perimeter road through a corrugated metal pipe and then falls steeply into Twomile Canyon. This description is illustrated on Figs. 5-16-1 and 5-16-2.

The outfall area is designated NPDES EPA 03A009 and is permitted to receive discharge water from cooling tower effluent blow-down. During an initial site investigation in July 1993 this outfall was reported to discharge water from equipment in building TA-3-102, cooling tower effluent, cooling tower blow-down, and noncontact cooling water from a furnace. All these sources used municipal water. The water from these sources was discharged to the permitted outfall via the storm sewer (LANL 1993, 17-935). Since the 1993 site visit, the noncontact cooling water from the furnace has been re-routed to the sanitary sewer; future plans include eliminating the need for the NPDES permit at the outfall by also rerouting the cooling tower effluent and blow-down to the sanitary sewer (LANL 1993, 17-935). Currently, the

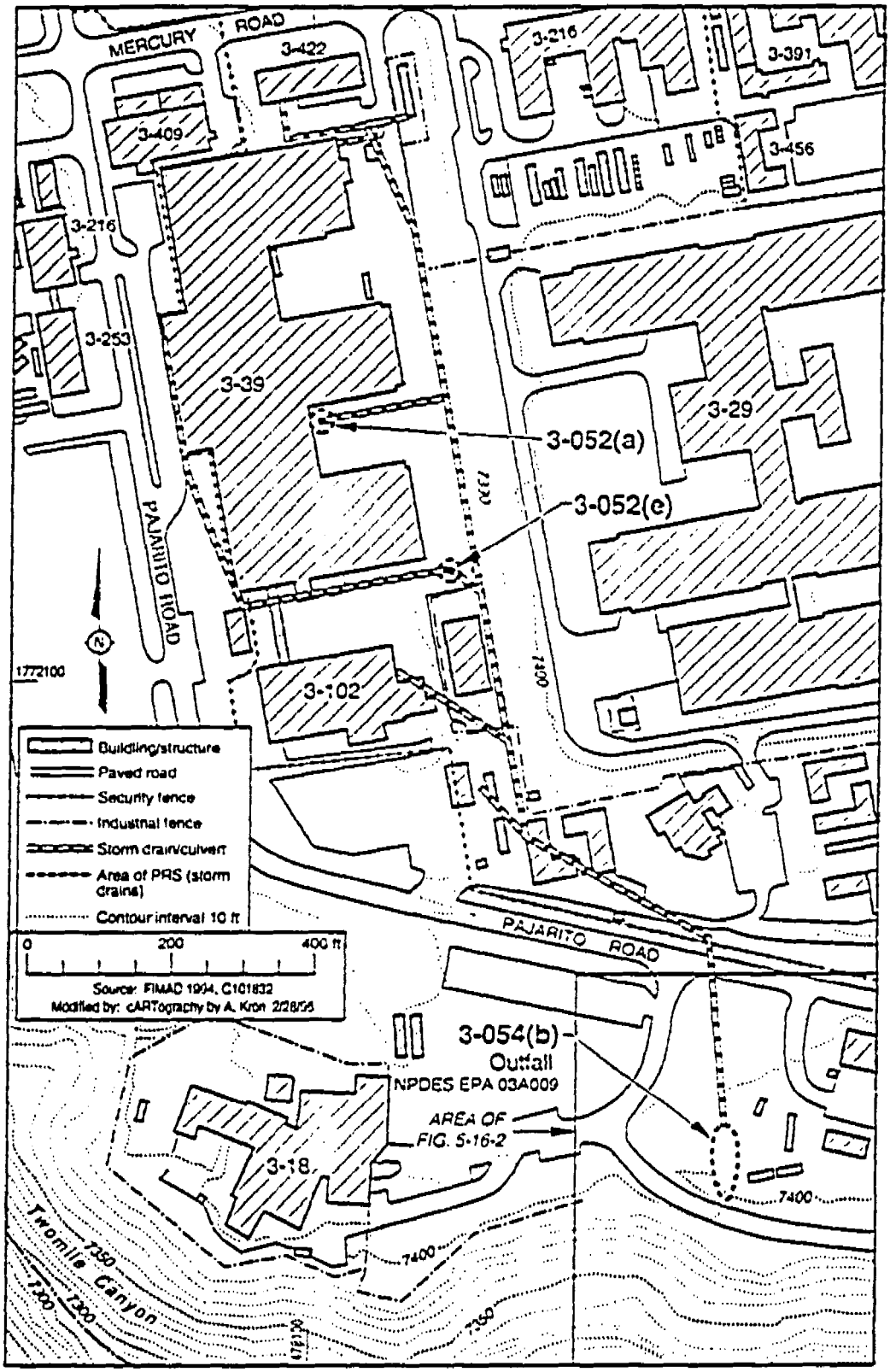
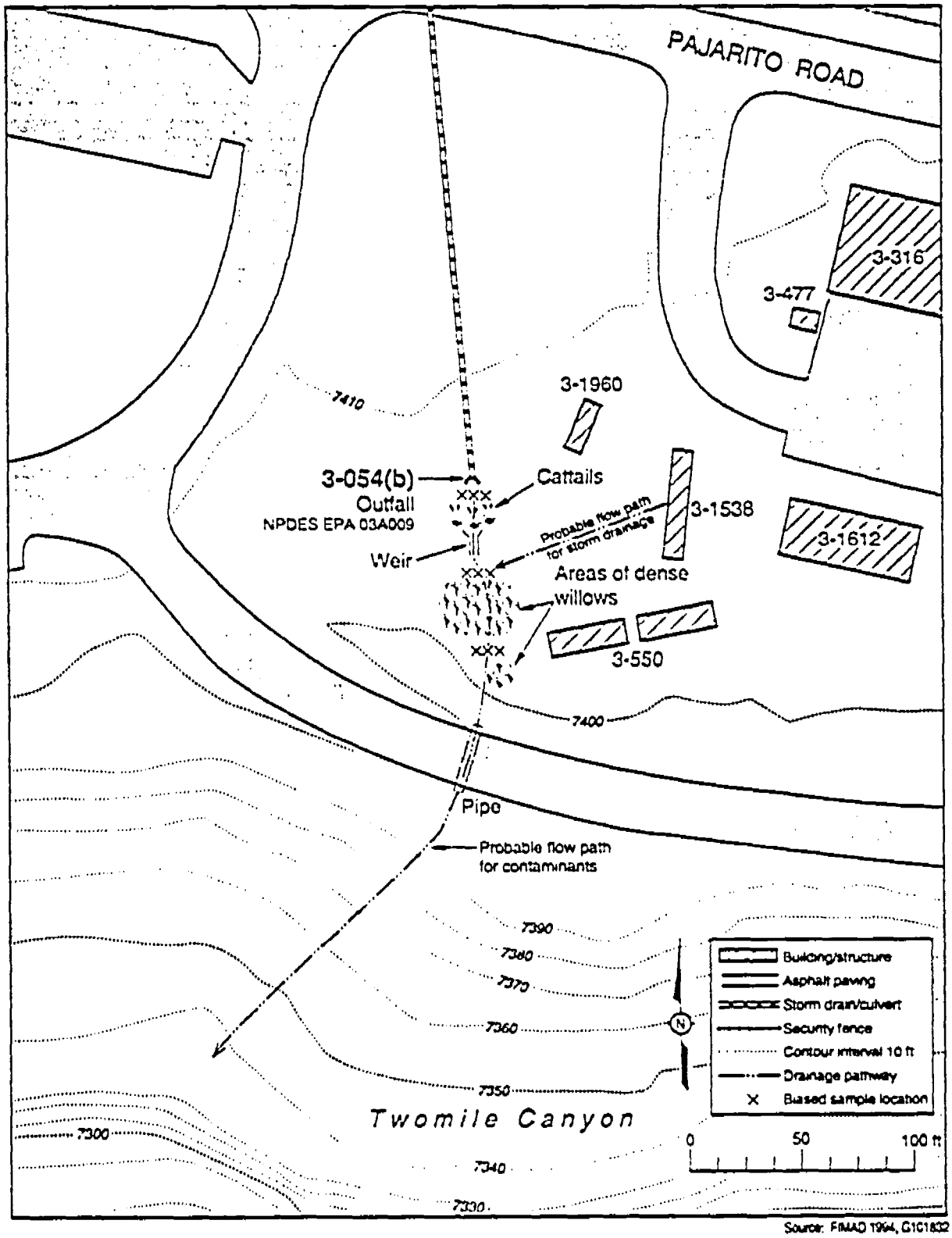


Fig. 5-16-1. Site location map of SWMUs 3-054(b), 3-052(a), and 3-052(e).



Source: FIMAD 1994, G101832
Modified by: cARTography by A. Kron 3/5/95

Fig. 5-16-2. Location of sampling sites for SWMUs 3-054(b), 3-052(a), and 3-052(c).

Laboratory monitors the outfall quarterly and reports flow rate, total suspended solids, chlorine, pH, and total phosphorus under the NPDES requirement.

Additional discharges to this outfall area via the TA-3 storm sewer include storm water runoff from surface areas surrounding 26 buildings in TA-3. Runoff from a total of 94 roof drains from area buildings (86 from TA-3-39, 6 from TA-3-102, and 2 from TA-3-422) is also routed to the storm sewer, and eventually discharges to the outfall (LANL 1992, 17-863).

During a one-time sampling event in 1993, in preparation for the NPDES storm water program implementation, storm water runoff was sampled at outfall SWMU 3-054(b) and analyzed for wastewater parameters, radionuclides, metals, cyanide, total phenols, VOCs, SVOCs, pesticides, and herbicides (LANL 1993, 17-1114). Several constituents were identified above quantitation limits; however, none was above SAL. The constituents with levels greater than quantitation limits were chromium, lead, zinc, and heptachlor epoxide (pesticide). Results of the 1993 sampling event are compared to SALs in Table 5-16-1. The metals may be attributed to background levels and/or facility runoff; while the pesticide concentrations may have been the result of a recent application at an upgradient area. Soil and sediments at the outfall area or in the drainage below have not been sampled.

TABLE 5-16-1

COMPARISON OF 1993 SAMPLING RESULTS AT SWMUs 3-052(a,e) WITH SALs

PCOC	SALS IN WATER (µg/L)	RESULTS OF 1993 SAMPLING EVENT (µg/L)
Chromium	100	<10
Lead	50	11
Zinc	10 000	11
Heptachlor epoxide	0.2	0.14

SWMU 3-052(a) is a storm drain located near the main storage dock area on the east side of TA-3-39 (Fig. 5-16-1). This SWMU consists of a 100 x 10-ft area used to store dumpsters that contained waste materials from machining

operations in TA-3-39. Metal filings and oil stains were noted surrounding the dumpsters and in the storm drain during an initial site reconnaissance visit (Sobojinski 1993, 17-1099). From 1954 to 1991 materials from machining operations were disposed of in dumpsters and included metal filings such as aluminum, stainless steel, copper, and brass; solvents such as trichloroethane (TCA) and trichlorethene (TCE) used for degreasing; and, ethylene glycol used as a coolant (LANL 1994, 17-1115). Material from the dumpsters may have leaked and been washed into the storm drain. Currently, only metal filings go to the dumpsters; all liquids are drummed, transported to TA-54, and eventually shipped off-site for disposal.

Since the 1993 site reconnaissance visit, a metal barrier consisting of angle irons and silastic material has been constructed around the dumpster area and the storm drain has been sealed using a metal plate to prevent runoff and discarded materials from entering the storm drain system (LANL 1994, 17-1115). Future plans include extending the roof over the dumpster area to prevent rainwater from entering the bermed dumpster area. Currently, rainwater must be pumped to a basement sump that utilizes an oil-water separator before draining to the sanitary sewer system.

SWMU 3-052(e) is a storm drain located approximately 50 ft southeast and downgradient of an indoor paint booth located in the southeast corner of TA-3-39. This storm drain may have received paint compounds and residual solvents used in painting operations. Paint stains were observed on the asphalt surface in a 50-ft square area just outside the rollup door to the indoor paint spray booth and in the vicinity of the inlet to the storm drain. Visual inspections of the site suggest that items too large for the paint booth were spray-painted outdoors on the asphalt surface adjacent to the building.

5.16.2 Investigation Approach and Objectives

Investigation activities for this aggregate will focus on detecting the presence and nature of potential contamination in soils at the outfall area SWMU 3-054(b). PCOCs for this aggregate include Appendix VIII metals and SVOCs. Radioactive contaminants could be suspect in the fluids disposed of from the machine shop, but it is unlikely. However, a minimum of two samples for radiological constituents will be collected as described in Subsection 5.16.3. Because metal filings, residual solvents, and paint-related

compounds may have been transported via the storm sewer and discharged to the outfall area, it is unlikely that volatile constituents, including ethylene glycol, discharged via the outfall would accumulate in soils due to volatilization during transport. However, samples will be field screened for VOCs and submitted for laboratory analysis if VOCs are detected. Confirmatory samples will be submitted for laboratory VOC analysis if VOCs are not detected using field screening results. It is important to note that if sampling results of the outfall area do not indicate the presence of PCOCs above SALs, that contaminants may have accumulated and may be present in the storm sewer pipe at concentrations above SALs. Potential contamination within the storm sewer pipe should be evaluated prior to any storm drain cleanout or any decontamination and decommissioning of the storm drain system.

Biased sampling will be conducted within the soils at the drainage area where contamination is most likely to exist. This biased approach is based on the known history of the PRSs and the PCOC and soil migration potential described in Subsection 5.0.3 of Addendum 1.

Sampling for SWMUs 3-052(a), 3-052(e), and 3-054(b) will be performed in the drainage downstream of the outfall. In order to collect representative samples below the outfall, sample locations are selected along transects positioned perpendicular to flow direction. Transect spacing along the drainage was selected based on existing topography and soil deposition. Additionally, the transects were also spaced to provide information on the influence of other runoff sources entering the outfall (or drainage area) at approximately 25 ft and 75 ft downgradient of the discharge pipe to the SWMU; and various sources of contamination to the outfall. The number of samples and number of locations along each transect were selected based on drainage topography, drainage width, and soil deposition. The PCOCs identified for this site are most likely to have accumulated in surface soil; however, episodes of deposition and migration may have distributed PCOCs in subsurface soils. Therefore, samples will also be collected from the soil-tuff interface.

5.16.3. Sample Locations and Methods

The nine sampling locations that will be used to identify the presence and nature of the PCOCs are shown on Fig. 5-16-2. Based on the rationale presented in Subsection 5.16.2, the area directly below the outfall discharge will be sampled at three transects perpendicular to the direction of the flow. Three distinct locations will be sampled along each transect. The first transect will be located within approximately two feet downgradient of the discharge pipe. One sample site along the transect will be located at the center of the discharge area, with the other two sample sites located on each side of the center site at a distance equal to the radius of the discharge pipe. A second transect will be located approximately 25 ft downgradient of the discharge pipe, beyond the south end of the weir, and 1 ft downgradient of the drainage swale which contributes runoff from surrounding areas. One sample site along the transect will be located in the approximate center of the weir discharge with the other two sites on either side, approximately one-quarter of the way up (vertically) from each channel bank incline. A third transect of three sites will be located approximately 75 ft downgradient of the discharge pipe between two distinct areas of dense willow growth. These sample locations will include the centers of two small, deeper-cut channels and a point midway between the two channels. All sample locations are subject to change based on field conditions at the time of sampling.

The depth from the soil surface to the soil-tuff interface is expected to be no greater than 12 in. along the length of the outfall. Prior to sample collection, the depth to the soil-tuff interface will be determined at each location by driving a blunt, stainless steel rod into the ground.

As previously noted, the soil intervals where PCOCs have most likely accumulated are surface soil and the soil-tuff interface. Soil samples will be collected from the 0 to 12-in. interval or to depth if the depth to the soil-tuff interface is 18 in. or less. If the depth to the soil-tuff interface is greater than 18 in., an additional sample will be collected as described above from the interval immediately above the soil-tuff interface. An aliquot of soil will be collected from the sample intervals prior to homogenization and submitted for laboratory analysis of SVOCs. The remainder of each sample interval will be

homogenized and then submitted for laboratory analysis of Appendix VIII metals.

Each 12-in. sample interval will be field-screened for VOCs as described in Subsection 5.0.5 of Addendum 1. Samples will also be screened for radiological constituents as described in Subsection 5.0.5 of Addendum 1. In the absence of field detected radiological constituents, 10% of the sampling sites will be randomly selected for confirmatory sampling. In no case will fewer than two confirmatory samples be collected. These samples will be sent to a fixed laboratory for confirmatory gross alpha/beta analysis, gamma spectroscopy, and tritium analysis. In the absence of field-detected VOCs, one adjacent sample from each transect collected at the soil-tuff interface will be submitted for laboratory VOC analyses to validate field-screening data.

The continuous soil samples will be collected using LANL-ER-SOP-06.10,R0, Hand Auger and Thin-Wall Tube Sampler; a split-tube will be used to facilitate sample removal. The adjacent samples for VOC analysis will be collected using a hand auger fitted with a brass sleeve. If the depth to the tuff is less than 12 in. at a location, composite samples may be needed to ensure adequate sample volume for appropriate analyses as determined by the field team leader. Specific sample collection procedures that must be followed are discussed in Appendix D of Addendum 1.

5.16.4 Laboratory Analyses

Soil samples will be laboratory analyzed for Appendix VIII metals, SVOCs, and VOCs using appropriate EPA methodology. The number of anticipated samples, their locations and the types of analyses are summarized in Table 5-16-2. One rinsate blank and one field collocated sample will also be analyzed as a maximum number of QC samples as determined using the guidelines in the site-specific QAPjP, Annex II, Note 2A of Addendum 1. All samples will be prepared and shipped in accordance with LANL ER standard operating procedures for chain-of-custody and transportation as listed in Appendix D of Addendum 1.

TABLE 5-16-2

SCREENING AND ANALYSIS FOR OU 1114 PHASE 1 SAMPLING PLAN SUMMARY OF SWMU 3-054(b) and 3-052(a,e), TWOMILE CANYON OUTFALL

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LABORATORY ANALYSIS			
									ORGANICS		METALS
SAMPLING LOCATION DESCRIPTION	NO. OF SAMPLE LOCATIONS	SAMPLE DEPTH (IN)	TOTAL NO. OF SAMPLES	SAMPLE I.D. NUMBER	RADIATION SCREENING[2]	ORGANIC VAPOR SCREENING (PID/FID)	RAD VAN ANALYSIS[3]	GROSS ALPHA/BETA, GAMMA SPECTROSCOPY AND TRITIUM	VOCs (SW 8240)	SVOCs (SW 8270)	APPENDIX VIII METALS (SW 6010, 7000)
Canyon outfall											
First transect	3	0 - 12	3		3	3	3			3	3
		s/t[5]	3		3	3	3			3	3
Second transect	3	0 - 12	3		3	3	3			3	3
		s/t	3		3	3	3			3	3
Third transect	3	0 - 12	3		3	3	3			3	3
		s/t	3		3	3	3			3	3
QC SAMPLES[1]											
Field Collocated	1	TBD	1		1	1	1			1	1
Rinsate Blank	NA	NA	2							1	1
Confirmatory samples	5	TBD	5		5	5	5	2[4]	3[4]		
TOTALS	15		26		24	24	24	2	3	20	20

[1]QC samples are determined using guidelines outlined in the site specific QAPJP, Annex II, note 2A of this workplan. Location determined by the Field Team Leader.

[2]Gross alpha, beta, and gamma using field instrumentation.

[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.

[4]Represents minimum number of confirmation samples to be submitted for VOCs and radiological constituents based on field screening results. Actual number may vary.

[5]s/t = soil/tuff interface (12-in. interval above interface).
NA = Not applicable.
TBD = To be determined in field.

5.17 SWMU 3-001(e): Drum Storage West of TA-3-30

5.17.1 Description and History

SWMU 3-001(e) is the former waste oil storage area approximately 15-ft long by 4-ft wide. The area served the vacuum pump repair shop, located on the west side of TA-3-30, the main Laboratory warehouse (Fig. 5-17-1).

The vacuum pump repair shop was located in TA-3-30 between 1950 and 1992. From approximately 1950 to 1957 waste oil contaminated with radionuclides, rinse solvents, and waste mercury from vacuum pumps repaired at the shop was discharged via a pipe to an area immediately west of TA-3-30 identified as SWMU 3-010(a). After 1957 the vacuum pump waste oil was emptied into a stainless steel sink enclosed in a Plexiglas® hood, located within the vacuum pump repair shop. Discharge from the sink flowed outside into barrels located in an unpaved area on the west side of TA-3-30; this storage area is the former waste oil storage area, SWMU 3-001(e). Records indicate that barrels often overflowed prior to being hauled off-site for disposal (LANL 1992, 17-720).

In the early 1960s the storage barrels were replaced by a 100 to 200-gal. holding tank within a concrete, secondary containment berm. Waste oil from the holding tank was periodically pumped into barrels for disposal at TA-54 (LANL 1992, 17-720). A concrete sump was constructed in the former waste oil storage area and the surrounding area was paved in approximately 1984; however, it is not known whether the area was regraded prior to asphalt application. The concrete sump is 15 ft long by 4 ft wide, and is 6-in. deep in one section and 18-in. deep in the other section. Waste oil was piped from TA-3-30 directly into 55-gal. drums located on a grate above the sump. In 1988 and 1989 the disposal process was upgraded so that the vacuum pump oil was drained into four different barrels to separate the contaminants into hazardous waste categories. The entire vacuum pump repair operation was discontinued in late 1992 and the sump area is proposed for decommissioning.

A 1993 Phase I investigation at SWMU 3-010(a) discovered elevated levels of TPH, mercury, lead, and tritium. Low levels of plutonium-238 and -239, uranium, and cesium-137 were also discovered. As a result of this

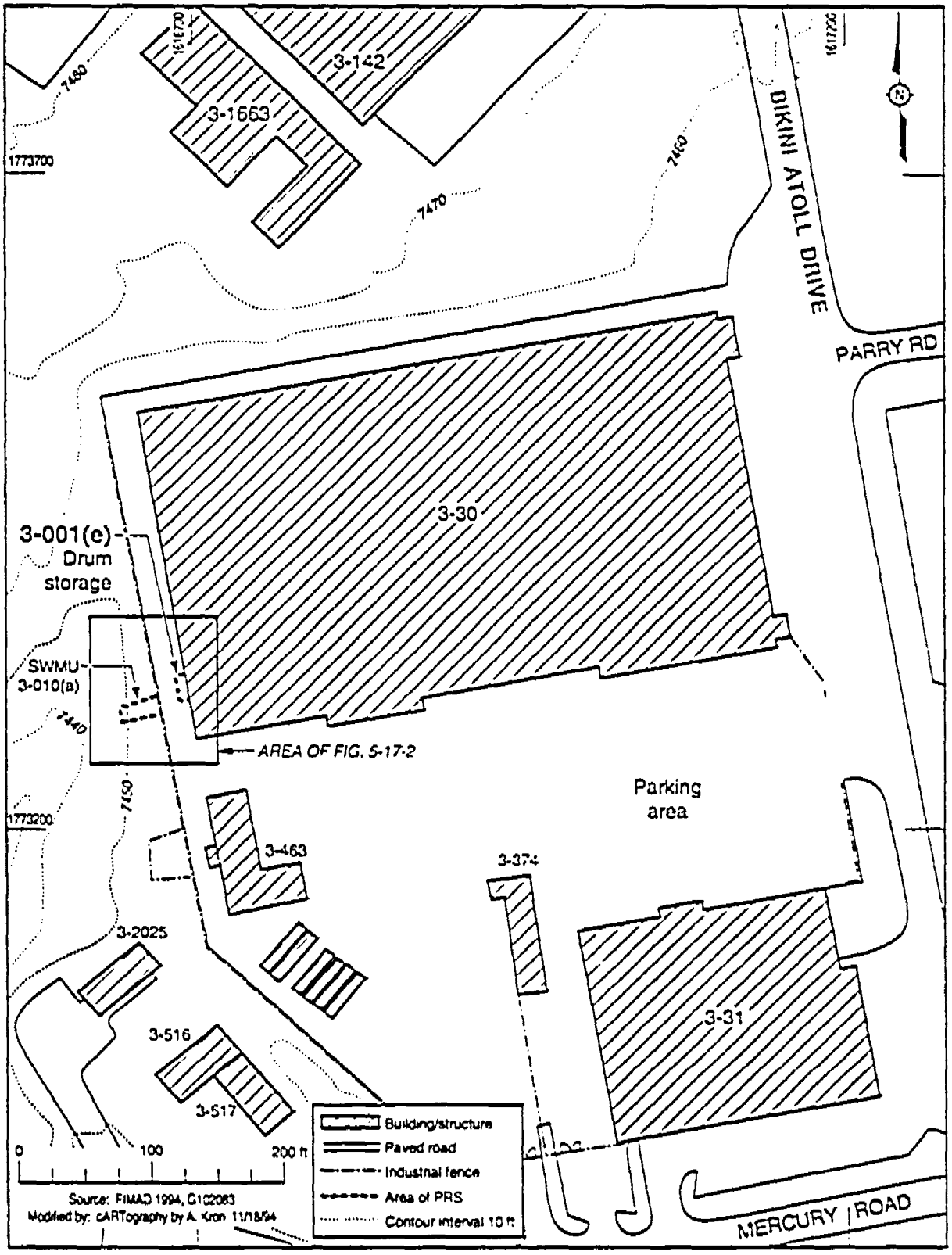


Fig. 5-17-1. Site location map of SWMU 3-001(e).

investigation, a voluntary corrective action (VCA) was implemented in April 1994 to remove contaminated soil from the site. Verification analytical results from soil samples collected at the soil-tuff interface (approximately 12 ft below ground surface) indicated that remaining mercury concentrations were below SALs. However, halogenated organic compounds and TPH were detected, resulting in the need for additional site characterization. A Phase II investigation was implemented from September through October 1994 at SWMU 3-010(a) in order to determine the extent of the contamination. As part of this investigation, a borehole was drilled in the area between SWMUs 3-010(a) and 3-001(e) immediately west of and adjacent to the concrete sump. Surface and subsurface samples were collected and a monitor well was installed to monitor shallow subsurface water encountered at approximately 23 ft below ground surface. Analytical information collected from this borehole is probably associated with disposal practices at SWMU 3-010(a) and spills from drums that overflowed and waste oil transfer activities from SWMU 3-001(e). The waste oil contamination source identified for SWMU 3-010(a) is, therefore, the same potential contaminant source as for SWMU 3-001(e). The extent of contamination and the risk associated with contamination from previous disposal practices and spills associated with these SWMUs will primarily be addressed in association with investigations conducted for SWMU 3-010(a).

5.17.2 Investigation Objectives and Approach

The objective of the investigation activities for SWMU 3-001(e) is to determine the presence and nature of potential contamination associated specifically with SWMU 3-001(e). The objective will be achieved by evaluating if contamination exists within the soils immediately beneath the concrete sump.

Because the integrity of the concrete sump is unknown, a biased sampling approach will be used within the underlying soils. The PCOCs for SWMU 3-001(e) include tritium, plutonium-238 and -239, uranium, cesium-137, TPH, VOCs, and Appendix VIII metals. These are the same PCOCs as the contaminants of concern for SWMU 3-010(a).

5.17.3 Sample Locations and Methods

The proposed sampling and analyses activities will be conducted concurrently with decontamination and decommissioning (D & D) activities for the sump. The corrugated steel roof and the concrete sump will be removed during D & D. After the sump is removed, six biased samples will be collected from exposed soil. One sample site will be located adjacent to the midpoint at each of the four sides of the area of exposed soil, and two sample sites will be located approximately five feet on either side of the midpoint along the north-south axis through the exposed soil (Fig. 5-17-2). If cracks are observed in the sump and/or stains exist in the surrounding soil, additional biased sample sites will be selected to include these areas.

Field screening for VOCs will be conducted as described in Subsection 5.0.5 of Addendum 1. In the absence of field-detected VOCs, confirmatory samples will be collected adjacent to two of the sites in the base of the excavation at the 12 to 24-in. interval and will be submitted for laboratory VOC analysis to validate field-screening data.

Soil samples will be collected from the 0 to 12-in. interval. An aliquot of soil will be collected from the sample intervals prior to homogenization and be submitted for laboratory analysis of TPH. The remainder of the sample interval will be homogenized and then submitted for laboratory analysis of isotopic plutonium, isotopic uranium, tritium, gamma spectroscopy for cesium, and Appendix VIII metals. Samples will also be collected from the 12 to 24-in. interval and submitted for laboratory analysis of TPH only.

Soil samples collected for TPH and VOC analyses will be immediately analyzed on site by the mobile chemical analysis van. Samples will continue to be collected in 12-in. intervals at each of the six locations and analyzed for TPH until two successive intervals are reported as containing less than 100 ppm TPH or until the soil/tuff interface is encountered. At this final sample interval, samples will be collected for all constituents that were analyzed for in the first 0 to 12-in. interval. This sampling strategy is designed to determine the extent of contamination at this site. As determined by the investigation of SWMU 3-010(a), TPH is a good indicator of collocated tritium and VOCs.

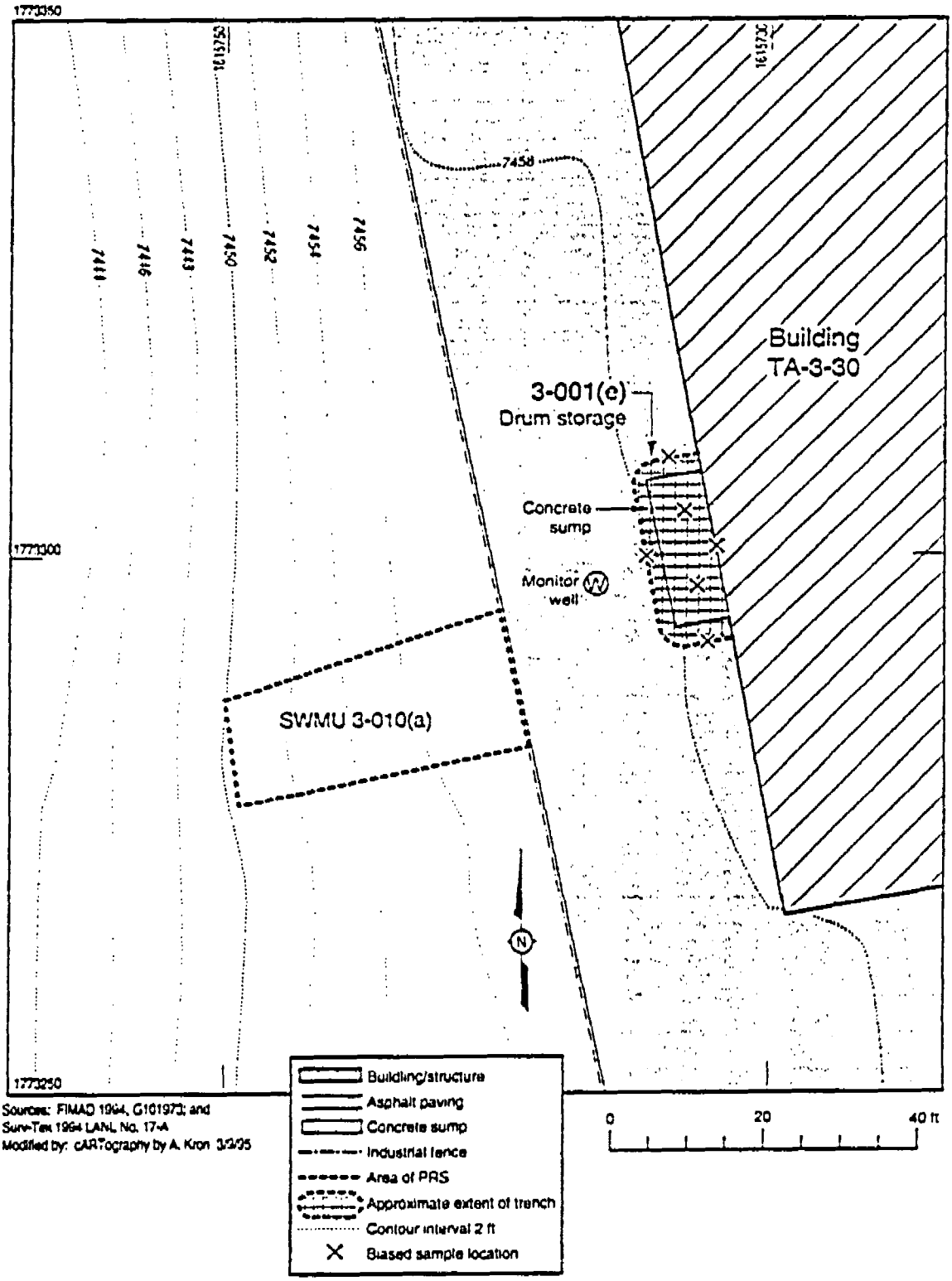


Fig. 5-17-2. Location of sample sites for SWMU 3-001(e).

Soil samples will be collected using the LANL-ER-SOP-06.09, R0 Spade and Scoop Method for Collection of Soil Samples. Soil samples collected for VOCs and TPH analyses from the 12 to 24-in. interval will be collected using the LANL-ER-SOP-06.10, R0, Hand Auger and Thin-Wall Tube Sampler. A split tube will be used to facilitate sample removal. Specific sample collection procedures that must be followed are discussed in Appendix D of Addendum 1.

5.17.4 Laboratory Analyses

Soil samples will be analyzed in a fixed laboratory for tritium (in soil moisture and in TPH), isotopic plutonium, isotopic uranium, gamma spectroscopy for cesium, and Appendix VIII metals using appropriate EPA methodologies. The number of anticipated samples, their locations, and the types of analyses are summarized in Table 5-17-1. One rinsate blank and one field collocated sample will be submitted for analyses as the maximum number of QC samples determined by using the guidelines in the site-specific QAPjP, Annex II, Note 2A of Addendum 1. All samples will be prepared and shipped in accordance with LANL ER standard operating procedures for chain-of-custody and transportation as listed in Appendix D of Addendum 1.

TABLE 5-17-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE 1 SAMPLING PLAN SUMMARY OF SWMU 3-001(e), FORMER WASTE OIL STORAGE AREA

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LAB ANALYSIS		FIELD LAB ANALYSIS		
								RADIO-NUCLIDES		METALS	ORGANICS	
SAMPLING LOCATION DESCRIPTION	NO. OF SAMPLE LOCATIONS	SAMPLE DEPTH (IN.)	TOTAL NO. OF SAMPLES	SAMPLE I.D. NUMBER	RADIATION SCREENING[2]	ORGANIC VAPOR SCREENING (PID/FID)	RAD VAN ANALYSIS[3]	ISOTOPIC-PLUTONIUM, ISOTOPIC-URANIUM, GAMMA SPECTROSCOPY	TRITIUM[5]	APPENDIX VII METALS (SW 6010, 7000)	VOCs (SW 8240)	TPH (SW 8015)
Soil underlying removed sump	6	0 - 12	6		6	6	6	6	6	6		6
		12 - 24	6		6	6	6					6
Confirmatory field samples	6	s/t[7]	6		6	6	6	6	6	6	6	6
QC SAMPLES[1]												
Field Collocated	1	TBD	1		1	1	1	1	1	1		1
Rinsate Blank	NA	NA	1						1	1	1	
Confirmatory samples	2	TBD	2		2	2	2				2[4]	
TOTALS	15		22		21	21	21	13	14	14	9	19

[1]QC samples are determined using guidelines outlined in the site-specific QAPjP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.

[2]Gross alpha, beta, and gamma using field instrumentation.

[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.

[4]Represents minimum number of confirmatory samples to be submitted for VOCs based on field screening results. Actual number may vary.

[5]Tritium will be analyzed in soil moisture and in TPH.

[6] Intervals below the 12-24-in. interval will only be collected if TPH is found in either of the two overlying intervals. Sampling will be terminated when two successive intervals contain no detectable TPH or when tuff is encountered.

[7] s/t = soil-tuff interface (12-in. interval above interface).
NA = Not applicable.
TBD = To be determined in the field.

5.18 Vacuum Pump Exhaust Stains

5.18.1 Description and History

SWMUs 3-051(c) and 3-056(l) represent oil stains located along the east side of the Rolling Mill Building, TA-3-141 (Fig. 5-18-1). During a 1993 site reconnaissance visit, three distinct three to five-foot diameter stains were observed on uncompacted chip seal, primarily gravel, near the building. The oil stains were associated with the exhaust outlet from an indoor vacuum pump; the exhaust outlet is located immediately above the area stained with oil. The SWMU Report incorrectly states that these stains are from a leaking compressor and a drum storage area (LANL 1990, 0145). As documented in the material safety data sheet (MSDS), the oil used in the vacuum pump is nonhazardous mineral oil (LANL 1995, 1217). Another area stained with vacuum pump oil, and/or exhaust, that is inside a metal shed which housed a vacuum pump. Exhaust stains cover the concrete slab and were on the shed wall and the gravel surface surrounding the shed. These SWMUs will share a sampling background plan because of their proximity and the similar source of contaminants.

5.18.2 Investigation Approach and Objectives

Investigation activities for SWMUs 3-056(l) and 3-051(c) will focus on detecting the presence and nature of potential contamination within the soil underlying the gravel and from the concrete slab under the metal shed on the east side of TA-3-141. Because the source of contamination is from the vacuum pump exhaust which could potentially be contaminated with radionuclides and metals, PCOCs for this site include gross alpha/beta, gamma spectroscopy, tritium, TPH, and Appendix VIII metals.

Biased sampling will be conducted in soils underlying the gravel and from stained concrete at SWMU 3-056(l). This biased approach is based on historical information about the PRS, current observation of the site, and PCOC and soil migration potential described in Subsection 5.0.3 of Addendum 1.

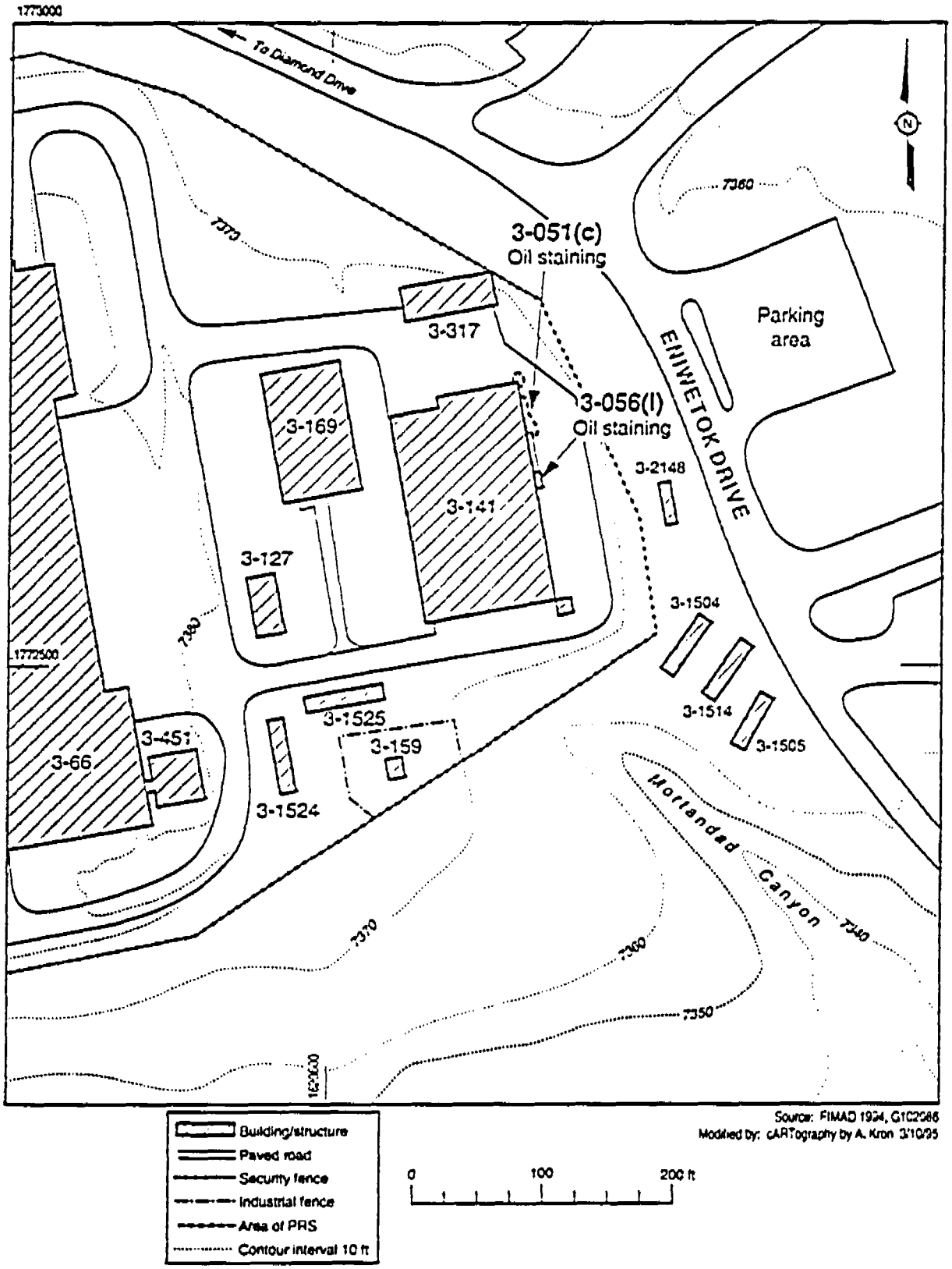


Fig. 5-18-1. Site location map of SWMUs 3-051(c) and 3-056(l).

5.18.3 Sample Locations and Methods

Figure 5-18-2 shows the area observed in 1993 that contains visible stains targeted for biased sampling. One biased sample will be taken from the approximate center of each of the three areas of visible staining, and from two chips of highly stained concrete. The exact sample sites will be selected in the field based on the presence of obvious stains.

All soil samples will be screened continuously for VOCs and radiological constituents in 12-in. intervals from the surface down to the soil-tuff interface, or to the clay-rich horizon, whichever comes first. Samples will be collected for VOC analysis as described in Subsection 5.0.5 of Addendum 1.

Prior to soil sample collection, the gravel will be removed from each location with a stainless steel shovel. All samples will be collected from the 0 to 12-in. interval immediately below the gravel and submitted for laboratory analysis. An aliquot of soil will be collected from the sample intervals prior to homogenization and submitted for laboratory analysis of TPH. The remainder of the sample interval will be homogenized and then submitted for laboratory analysis of gross alpha/beta, tritium, gamma spectroscopy for isotopic cesium, and Appendix VIII metals. Twelve-inch soil samples will also be collected from the clay-rich horizon, or from the soil-tuff interface if no clay-rich horizon is found. These samples will be prepared and submitted for laboratory analyses as described above for the 0 to 12-in. interval. The concrete chip samples will be analyzed only for Appendix VIII metals and radiological constituents as listed above.

All surface and subsurface soil samples will be collected using the Hand Auger and Thin-Wall Tube Sampler Method, LANL-ER-SOP-06.10, R0. A split tube will be used to facilitate soil sample removal. Adjacent samples for VOC analysis will be collected using a hand auger fitted with a brass sleeve. The concrete chip sample will be collected using LANL-ER-SOP-06.28, R0, Chip Sampling of Porous Surfaces. Specific sample collection procedures that must be followed are discussed in Appendix D of Addendum 1.

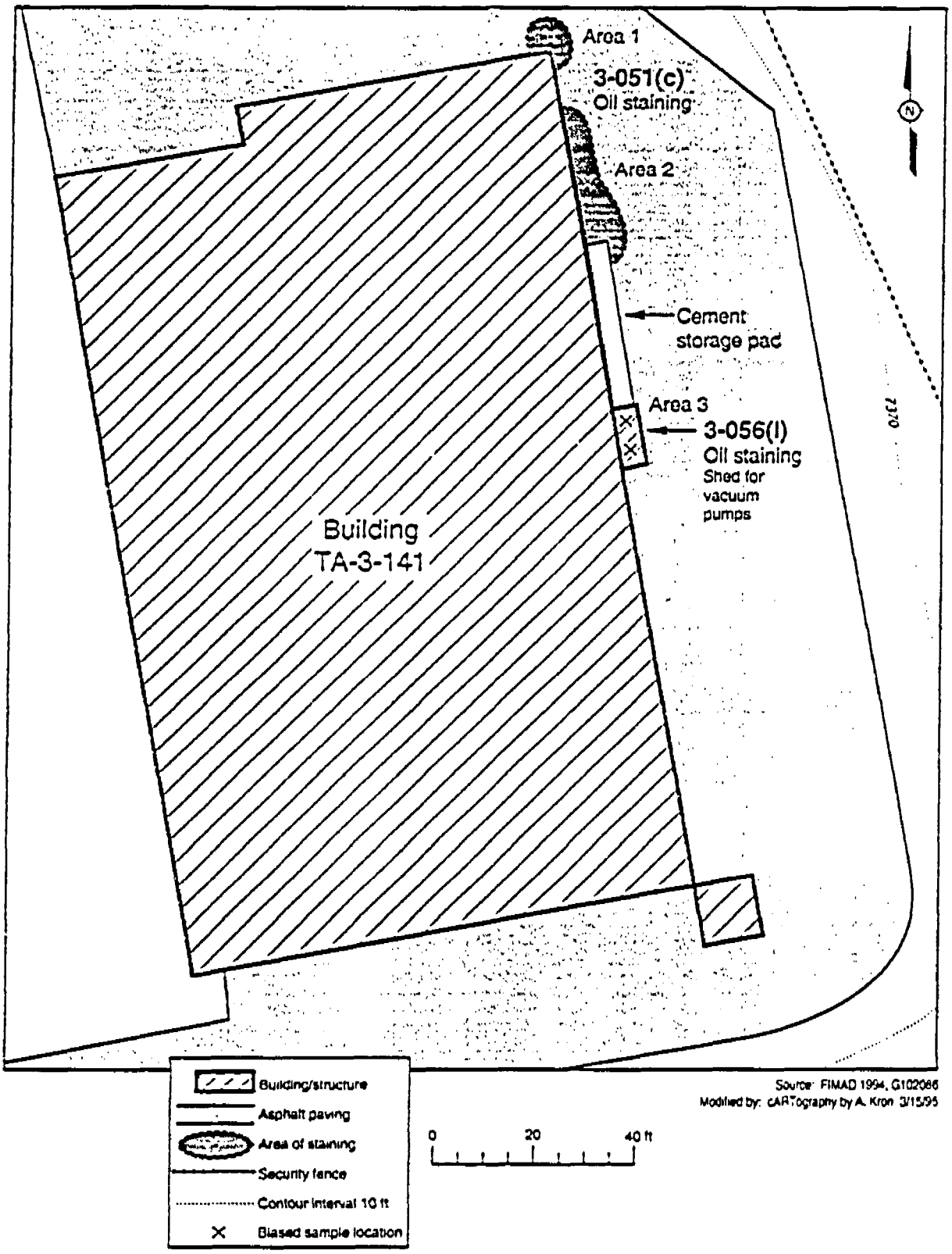


Fig. 5-18-2. Location of sample sites for SWMUs 3-051(c) and 3-056(l).

5.18.4 Laboratory Analyses

Soil samples will be analyzed in the laboratory for TPH, gross alpha/beta, gamma spectroscopy, tritium, and Appendix VIII metals. The adjacent soil samples will be analyzed for VOCs, using appropriate EPA methodology. The concrete chip samples may need special preparation (i.e., pulverization) prior to analyses for gross alpha/beta, gamma spectroscopy, tritium, and Appendix VIII metals. The number of anticipated samples, their locations, and the types of analyses are summarized in Table 5-18-1. One field collocated sample will be submitted for analyses as the maximum number of QC samples determined by using the guidelines in the site-specific QAPjP, Annex II, Note 2A of Addendum 1. All samples will be prepared and shipped in accordance with LANL ER standard operating procedures for chain-of-custody and transportation as listed in Appendix D of Addendum 1.

TABLE 5-18-1

SCREENING AND ANALYSIS FOR OU 1114
PHASE 1 SAMPLING PLAN SUMMARY OF
SWMUs 3-056(I) AND 3-051(c)
AREAS OF OIL STAINING ADJACENT TO TA-3-141

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LABORATORY ANALYSIS				
								RADIO-NUCLIDES		ORGANICS		METALS
SAMPLING LOCATION DESCRIPTION	NO. OF SAMPLE LOCATIONS	SAMPLE DEPTH (IN.)	TOTAL NO. OF SAMPLES	SAMPLE I.D. NUMBER	RADIATION SCREENING[2]	ORGANIC VAPOR SCREENING (PID/FID)	RAD VAN ANALYSIS[3]	GROSS ALPHA/BETA, GAMMA SPECTROSCOPY	TRITIUM	VOCs (SW 8240)	TPH (SW 8015)	APPENDIX VIII METALS (SW 6010, 7000)
Areas of staining												
Area 1	1	0 - 12 below gravel	1		1	1	1	1	1		1	1
		s/t[5]	1		1	1	1	1	1		1	1
Area 2	1	0 - 12 below gravel	1		1	1	1	1	1		1	1
		s/t	1		1	1	1	1	1		1	1
Area 3	1	0 - 12 below gravel	1		1	1	1	1	1		1	1
		s/t	1		1	1	1	1	1		1	1
Chip samples	2	0.6	2		2	2	2	2	2			2
QC SAMPLES[1]												
Field Collocated	1	TBD	1		1	1	1	1	1	1	1	1
Confirmatory samples	2	TBD	2		2	2	2			2[4]		
TOTALS	8		11		11	11	11	9	9	3	7	9

[1]QC samples are determined using guidelines outlined in the site specific QAPJP, Annex II, note 2A of this workplan. Location determined by Field Team Leader.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
[4]Represents minimum number of confirmation samples to be submitted for VOCs based on field screening results. Actual number may vary.
[5]s/t = soil/tuff interface (12-in. above interface).
TBD = To be determined in field.

5.~~19~~ 18 Press Building, TA-3-35, Outdoor Storage Area

5.19.1 Description and History

The PRSs included in this aggregate are SWMU 3-049(b) and area of concern C-3-014. SWMU 3-049(b) is the exhaust outlet that discharged from the south wall of the Press Building, TA-3-35. C-3-014 is the equipment storage area located southwest of TA-3-35 (Fig. 5-19-1). These PRSs can be evaluated using a single sampling and analysis plan because surface water drainage from both sites collects in the same locations and regrading and paving operations may have redistributed contamination from one site to another.

SWMU 3-049(b) is a discharge area, approximately 50 ft long by 20 ft wide, associated with the exhaust outlet from an inactive vacuum pump that served the furnaces in TA-3-35 (Fig. 5-19-1). The vacuum pump evacuated oil from the furnaces used for experiments in TA-3-35. The vacuum pump exhaust outlet is located eight feet above the ground on the south wall of TA-3-35. No oil stains were observed on the exhaust outlet pipe, wall, or ground below the pipe during a 1993 site reconnaissance survey. Additionally, a sign on the vacuum pump indicated that the pump contained non-PCB oil (LANL 1993, 17-900). A 10-ft by 8-ft area under the exhaust outlet pipe, described in the SWMU Report as being stained with oil, is now paved with asphalt (LANL 1990, 0145). Paving of this area occurred at roughly the same time that the vacuum pump was deactivated (in the late 1980s). The pavement is graded away from the exhaust outlet in predominantly west and northwest directions. Runoff from this area drains toward low-lying areas and to the northwest. It is assumed that regrading did not alter the pre-existing drainage pattern significantly because the storm water collection system continues to collect area runoff as designed.

C-3-014 is an equipment storage area, approximately 125 ft by 100 ft, located southwest of TA-3-35 (Fig. 5-19-1). This area is bounded by security fences to the north, south, and west and by TA-3-35 to the east. Most of this area is currently paved, except for a 15-ft wide strip of grass along the southern security fence. The grassy area widens to approximately 30 ft southwest of TA-3-35. Runoff from this storage area drains to the same low-lying areas as SWMU 3-049(b) (Fig. 5-19-2).

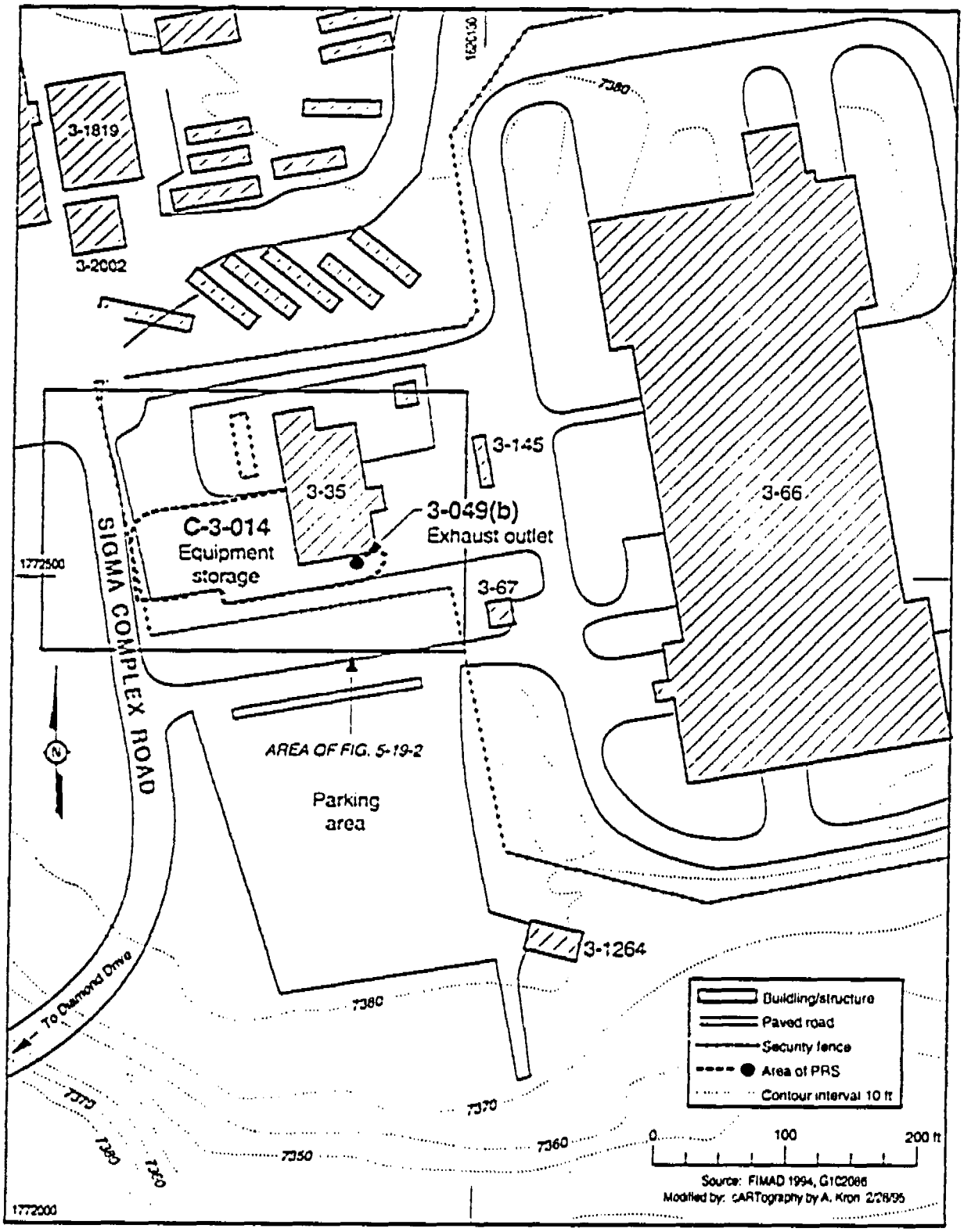


Fig. 5-19-1. Site location map of SWMU 3-049(b) and C-3-014.

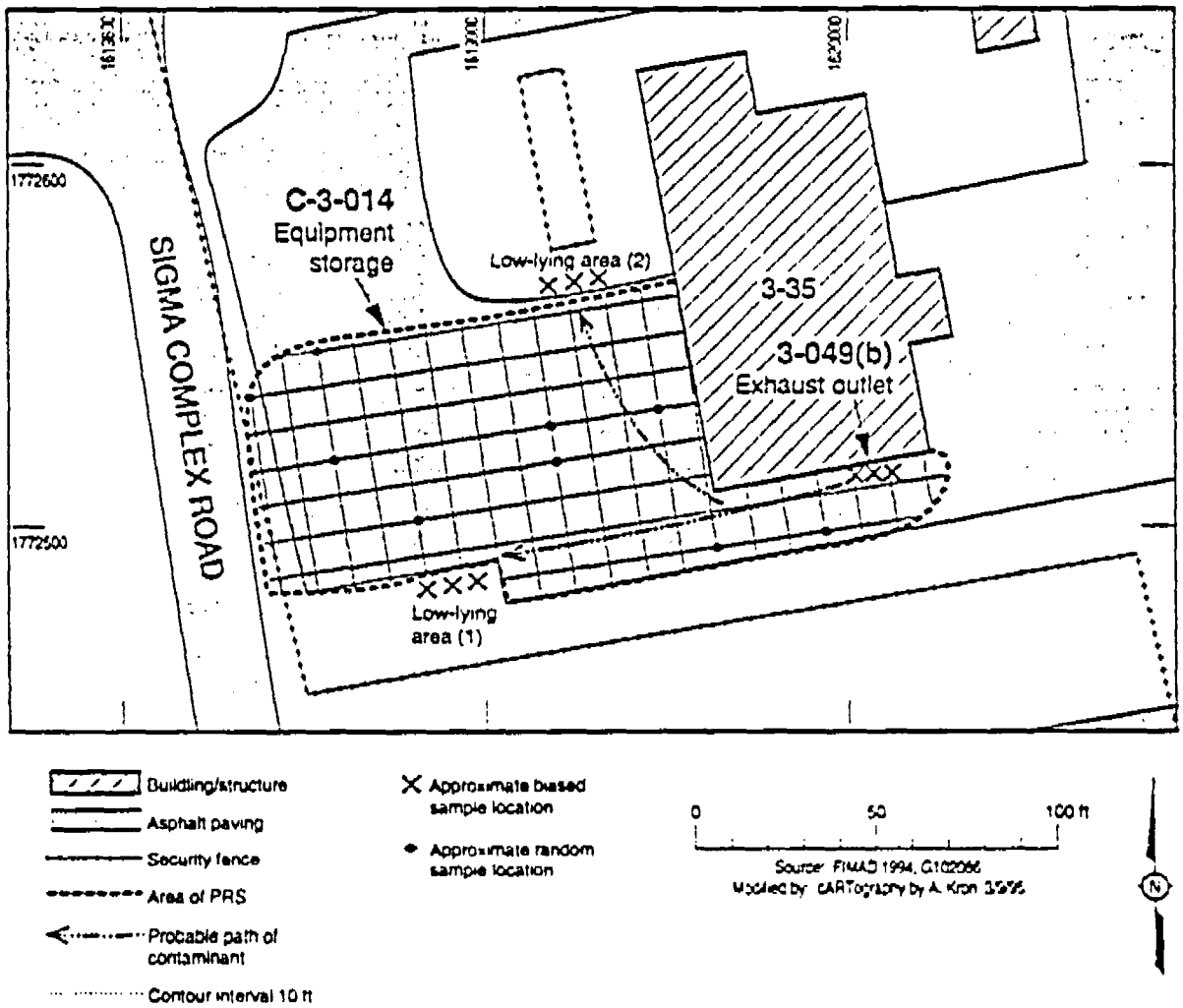


Fig. 5-19-2. Schematic representation of sampling sites for SWMU 3-049(b) and C-3-014.

Constructed in 1953, TA-3-35 housed operations to fabricate enriched uranium-loaded graphite and carbide fuel elements. Additionally, enriched uranium (uranium-235) was processed in an area located in the northern portion of the first floor of the building. As a result of the processing operation and the obsolete ventilation/exhaust system, the northern portion of the first floor is contaminated with uranium-235 and does not comply with current environmental safety and health requirements (LANL 1991, 17-254). In November 1991 the TA-3-35 was declared surplus or inactive due to lack of funding for facilities, equipment, and security upgrades (LANL 1991, 17-254).

Various pieces of equipment and molds from TA-3-35 are stored outdoors, within C-3-014 for salvage or because of space limitations within the building. In 1994 some equipment for salvage was found contaminated with radioactivity (LANL 1994, 17-1208). As a result, the area was roped off and posted as a radiologically controlled area. The current standard procedure for removing equipment from the building consists of taking swipe samples to test for radioactivity followed by decontamination, if necessary. However, there is no documentation to support if this activity was completed when the equipment was removed from the building. Swipes of the equipment and surrounding paved surfaces showed levels of less than 200 disintegrations per minute (dpm) beta contamination with negligible alpha and gamma contamination. January 18, 1994, contamination on the equipment and pavement was identified and was scheduled to have been cleaned up to levels published in the Los Alamos National Laboratory and the Department of Energy Radiological Control Manual (LANL 1994, 17-1206) or painted over on equipment to prevent spread of contaminant. Preliminary evaluation from the occurrence report showed that current handling and control procedures for depleted uranium had not been followed when the equipment was last used in the 1970s (LANL 1994, 17-1208).

5.19.2 Investigation Approach and Objectives

Investigation activities for this aggregate will focus on detecting the presence and nature of potential contamination within the soils at SWMU 3-049(b) and within the soils and asphalt at C-3-014. Because oil released from the vacuum pump exhaust outlet may have been contaminated with metals, and enriched uranium-contaminated equipment may have been stored outdoors

for several years, PCOCs for this aggregate include TPH, Appendix VIII metals, and enriched uranium. PCBs are also a PCOC for this aggregate because even though the vacuum pump was tagged non-PCB oil at the time of the site visit, there is no documentation to determine what type of oil was used in the vacuum pump over its operational life. Therefore, verification sampling for PCBs will be conducted during this sampling effort.

Both biased and random sampling methods will be used to investigate SWMU 3-049(b) and C-3-014. Biased sampling will target areas most likely to be contaminated, based on historical information, current observations of site use and the PCOC and soil migration potential described in Subsection 5.0.3 of Addendum 1.

Random sampling will supplement the biased sampling activities by providing greater coverage of the entire aggregate area, thus increasing the likelihood that all contaminated areas will be identified. These random sampling locations will address the uncertainties associated with past equipment storage practices and the regrading and paving operations. Additionally, it is unknown if clean fill was used to regrade the area or existing soil was rearranged across the site. If existing soil was rearranged, a more widespread distribution of contamination might be expected.

5.19.3 Sample Locations and Methods

Prior to sampling, a 10-ft x 10-ft sampling grid will be generated from which samples will be randomly selected. A site reconnaissance will be conducted to verify sites selected and then a geodetic survey will be conducted for those grid nodes selected for sampling (Fig. 5-19-2). Based on the potential contaminant redistribution from grading or drainage patterns, the contaminant distribution from wind and water at the unpaved areas along the southern boundary of TA-3-35, and the presence of low-lying areas downgradient of the aggregate area where sediments may have accumulated, approximately 25% of the aggregate area may be contaminated. If 25% of the area is assumed to be contaminated and a 90% level of confidence is desired for detecting contamination present, 9 sample points will be randomly selected at grid nodes, using the equation discussed in Subsection 5.0.4 of Addendum 1.

Nine biased sample sites are located within areas where PCOCs are most likely to accumulate based on site-specific conditions. These areas include the soils underlying asphalt below the exhaust outlet and within the two low-lying unpaved areas that collect runoff (Fig. 5-19-2). Three sample sites were selected in the 10-ft x 8-ft area near the exhaust outlet and three sample sites were selected within each of the low-lying areas. At the exhaust outlet, one sample is located three feet directly south of the outlet pipe with the other two samples located five feet on either side of the first sample. Within each of the unpaved, low-lying areas, 3 sample sites spaced 5 to 10 ft apart are located along the soil-asphalt perimeter 3 to 5 ft from the asphalt into the soil area (at least one sample site will be located at the lowest point within the area).

All samples will be field screened and collected for VOCs and radiological constituents as described in Subsection 5.0.5 of Addendum 1. Confirmatory samples for radiological constituents will be submitted for isotopic uranium analysis only.

Up to nine samples of asphalt material will be collected from the random sample locations and submitted for laboratory analysis of isotopic uranium only. Prior to surface soil sample collection where asphalt is present, base course underlying the asphalt will be removed from the sample locations using a stainless steel shovel.

For both random and biased locations, soil samples will be collected from the 0 to 12-in. soil depth interval. An aliquot of soil will be collected from the sample intervals prior to homogenization and submitted for laboratory analysis of TPH. The remainder of each sample interval will be homogenized and then submitted for laboratory analysis of Appendix VIII metals and PCBs.

Soil samples from the accessible surface and immediately beneath the asphalt and base course will be collected using LANL-ER-SOP-06.09, R0, Spade and Scoop Method for Collection of Soil Samples. The TPH and adjacent VOC soil samples will be collected using LANL-ER-SOP-06.10, R0, Hand Auger and Thin-Wall Tube Sampler Method. A split tube will be used to facilitate soil sample removal. Adjacent samples for VOC analysis will be collected using a hand auger fitted with a brass sleeve. Asphalt will be sampled using LANL-ER-SOP-6.28, R0, Chip Sampling of Porous Surfaces

Method. Specific sample collection procedures that must be followed are discussed in Appendix D of Addendum 1.

5.19.4 Laboratory Analyses

Asphalt and soil samples will be analyzed in the laboratory for the constituents described above using appropriate EPA methodology. The number of anticipated samples, their locations, and the types of analyses are summarized in Table 5-19-1. One field duplicate will be submitted as a maximum number of QC samples determined by using the guidelines in the site-specific QAPjP, Annex II, Note 2A of Addendum 1. All samples will be prepared and shipped in accordance with LANL ER standard operating procedures for chain-of-custody and transportation as listed in Appendix D of Addendum 1.

TABLE 5-19-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE 1 SAMPLING PLAN SUMMARY OF SWMU 3-049(b) and C-3-014 PRESS BUILDING EXHAUST OUTLET AND EQUIPMENT STORAGE AREA

SAMPLE DESCRIPTION					FIELD SCREENING			FIXED LABORATORY ANALYSIS				
								RADIO-NUC-LIDES	ORGANICS			METALS
SAMPLING LOCATION DESCRIPTION	NO. OF SAMPLE LOCATIONS	SAMPLE DEPTH (IN.)	TOTAL NO. OF SAMPLES	SAMPLE I.D. NUMBER	RADIATION SCREENING[2]	ORGANIC VAPOR SCREENING (PID/FID)	RAD VAN ANALYSIS[3]	ISOTOPIC URANIUM	VOCs (SW 8240)	PCBs (SW 8080)	TPH (SW 8015)	APPENDIX VIII METALS (SW 6010, 7000)
Biased locations												
Exhaust outlet soils; 10-ft x 8-ft area	3	0 - 12 below base course	3		3	3	3			3	3	3
Low area (1)	3	0 - 12 below base course	3		3	3	3			3	3	3
Low area (2)	3	0 - 12 below base course	3		3	3	3			3	3	3
Random locations												
Soil (10-ft x 10-ft area)	9	0-12 below base course	9		9	9	9			9	9	9
		asphalt	9 max		9		9	9				
QC SAMPLES[1]												
Field Duplicate	1	TBD	1		1	1	1	1		1	1	1
Confirmatory samples	4	TBD	4		4	4	4	2[4]	2[4]			
TOTALS	23		23		32	23	32	12	2	19	19	19

[1]QC samples are determined using guidelines outlined in the site-specific QAP|P, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.

[2]Gross alpha, beta, and gamma using field instrumentation.

[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.

[4]Represents minimum number of confirmatory samples to be submitted for VOCs and radiological constituents based on field screening results. Actual number may vary.

TBD = To be determined in the field.

VCA

5.20 Former Product Drum Storage East of TA-3-22

5.20.1 Description and History

SWMU 3-047(d) is a former materials storage area for TA-3-22, the steam plant, and was probably constructed in 1954. SWMU 3-047(d) consists of the area formerly occupied by a 6-ft by 15-ft asphalt pad located adjacent to the east side of TA-3-22 (Fig. 5-20-1). Materials such as 30-weight motor oil and Stoddard® solvent were stored in as many as 15 drums at SWMU 3-047(d) from approximately 1954 to 1989. The drainage around the materials storage area was directed to the east. In 1987, a six-inch asphalt berm was added to the asphalt pad to contain rainwater and prevent runoff to the surrounding area. The drums within the storage area were stored horizontally on metal stands and spigots were used for dispensing the contents with collection pans under the spigots. There were no documented spills or releases of product in this area; however, accidental spills may have discharged unknown quantities of drum contents to the environment over the years. In 1989 a new location was selected for an upgraded materials storage area. The old asphalt pad was removed and disposed of at the Los Alamos Municipal landfill.

5.20.2 Investigation Approach and Objectives

Investigation activities for SWMU 3-047(d) will focus on detecting the presence and nature of potential contamination within the soils surrounding and downslope of the former materials storage area. Because motor oils and Stoddard® solvents were stored at this site without a roof or berm for approximately 30 years and the integrity of the asphalt used for the pad and berm is unknown, PCOCs for soil at this SWMU are TPH, Appendix VIII metals, and VOCs.

Based on the relatively unknown release history of SWMU 3-047(d), biased sampling will be conducted based on the criteria described in Subsection 5.0.3 to provide coverage of the former materials storage area.

5.20.3 Sample Locations and Methods

A total of six biased sample locations were selected for sampling at this PRS. Four samples will be collected at the downgradient edge and two will be

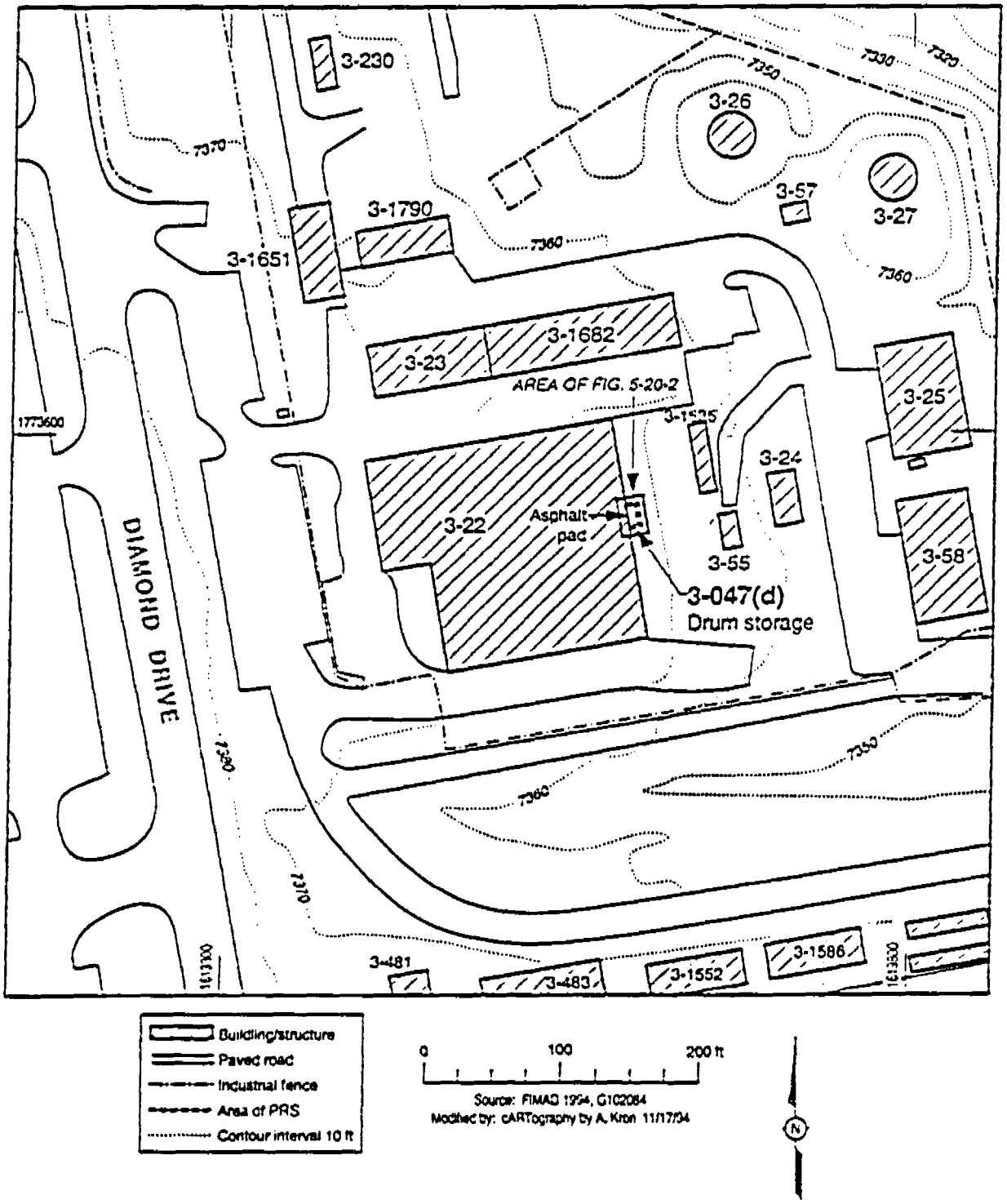


Fig. 5-20-1. Site location map of SWMU 3-047(d).

collected beneath the former asphalt pad. Figure 5-20-2 shows the approximate sample locations.

All samples will be field screened for VOCs as described in Subsection 5.0.5 of this work plan.

Soil samples will be collected and submitted for laboratory analysis from the 0 to 12-in. interval and from the 12-in. interval immediately above the clay-rich horizon or the soil/tuff interface if no clay-rich horizon is found. Depth intervals were selected based on the most likely PCOC accumulation areas considering the factors discussed in Subsection 5.0.3 of this work plan. An aliquot of soil will be collected from the sample intervals prior to homogenization and submitted for laboratory analysis of TPH. The remainder of each sample interval will be homogenized and then submitted for laboratory analysis of Appendix VIII metals. The six VOC samples collected from the bottom portion of the 0-12-in. interval and from above the clay-rich horizon or the soil/tuff interface will be adjacent to the six sample locations.

All soil samples will be collected using LANL-ER-SOP-06.10, R0, Hand Auger and Thin-Wall Tube Sampler. A split-tube will be used to facilitate sample removal. The adjacent samples for VOC analysis will be collected using a hand auger fitted with a brass sleeve. Specific procedures to be followed in the field for sample collection are discussed in Appendix D of Addendum 1 of this work plan.

5.20.4 Laboratory Analyses

Soil samples will be analyzed in the laboratory for TPH and VOCs using appropriate EPA methodology. The number of anticipated samples, associated locations, and EPA methods of analyses are summarized in Table 5-20-1. One field collocated sample will be submitted for analysis as a maximum number of QC samples determined by using the guidelines in the site-specific QAPjP, Annex II, Note 2A of Addendum 1. All samples will be prepared and shipped in accordance with LANL ER standard operating procedures for chain-of-custody and transportation as listed in Appendix D of Addendum 1 of this work plan.

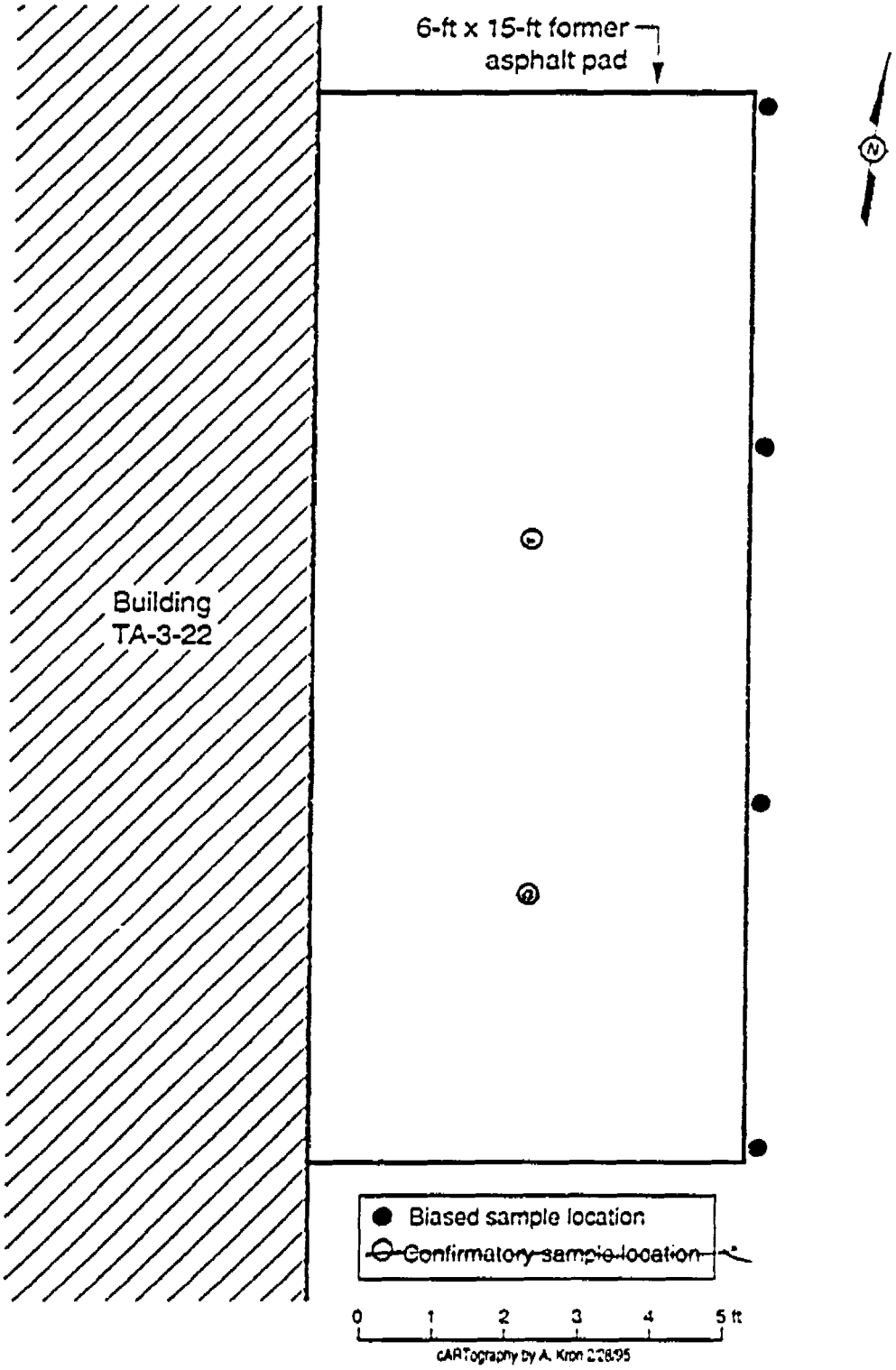


Fig. 5-20-2. Location of sample sites for SWMU 3-047(d).

TABLE 5-20-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE 1 SAMPLING PLAN SUMMARY OF SWMU 3-047(d) STORAGE AREA

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LABORATORY ANALYSIS		
								ORGANICS		METALS
SAMPLING LOCATION DESCRIPTION	NO. OF SAMPLE LOCATIONS	SAMPLE DEPTH (IN.)	TOTAL NO. OF SAMPLES	SAMPLE I.D. NUMBER	RADIATION SCREENING[2]	ORGANIC VAPOR SCREENING (PID/FID)	RAD VAN ANALYSIS[3]	VOCs (SW 8240)	TPH (SW 8015)	APPENDIX VIII METALS (SW 6010, 7000)
Random sampling										
2.5-ft x 2.5-ft grid	6	0 - 12	6		6	6	6	6	6	6
		s/t[4]	6		6	6	6	6	6	6
QC SAMPLES[1]										
Field Collocated	1	TBD	1		1	1	1	1	1	1
Rinsate Blank										
TOTALS	7		13		13	13	13	2	13	13

[1]QC samples are determined using guidelines outlined in the site-specific QAP$_1$P, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.

[2]Gross alpha, beta, and gamma using field instrumentation.

[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.

[4]s/t = soil/tuff interface (12-in. interval above interface).
TBD = To be determined in field.

VCA

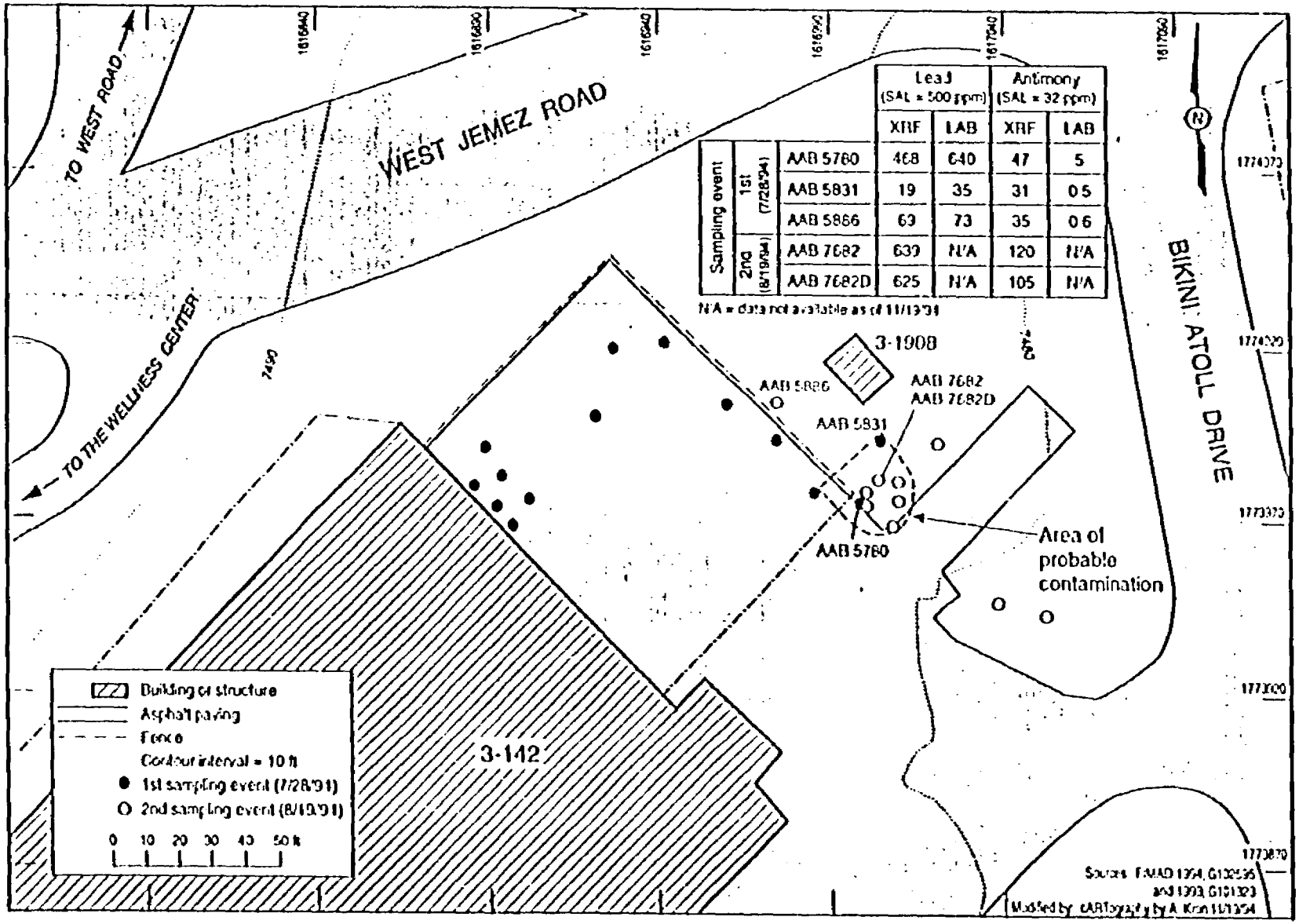
5.21 Storage Yard East of TA-3-142

5.21.1 Description and History

SWMU 3-003(p) is an outdoor storage area east of the warehouse building TA-3-142, which was built in 1960. SWMU 3-003(p) was a storage area for new, empty drums and miscellaneous excess equipment that included electrical capacitors and transformers from the 1960s to 1994. Some of this electrical equipment may have used insulating oils containing PCBs. Site visits documented unlabeled drums and stains on the soil from spills and/or leaks from the equipment (LANL 1993, 17-887). Most small transformers were placed on pallets; however, larger pieces of equipment were placed directly on the asphalt. The storage area, currently covered with asphalt, slopes gently southward from the warehouse and is bordered on the east by an unpaved, grassy area. The unpaved area is transected by a drainage channel that was partially re-routed during paving activities, and is bordered on the east by Bikini Atoll Drive (Fig. 5-21-1).

A Phase I investigation/screening assessment was scheduled for SWMU 3-003(p) during the summer of 1995. However, the operating group of TA-3-142 requested an excavation permit to expand an existing parking lot. This permit request was denied because the excavation included disturbing soil within an uncharacterized SWMU. In order to expedite the permit process, a Phase I investigation/screening assessment was implemented. Because the site history, conditions, and PCOCs for this SWMU were sufficiently similar to those of SWMU 61-002, a site sampled in 1994 and described in Subsection 5.10 of the 1993 RFI Work Plan for OU 1114 (LANL 1993, 1090), a similar approach was implemented at SWMU 3-003(p). Because a sampling and analysis plan was not approved for SWMU 3-003(p), the investigation was conducted at risk.

A biased sampling approach was used for the Phase I investigation/screening assessment to target areas with obvious staining on the asphalt and within the predominant drainage pattern. Asphalt and soil samples at the zero to six-inch depth interval were collected from beneath the asphalt in the drainage channel east of TA-3-142. Both soil and asphalt



Sampling event		Lead (SAL = 500 ppm) XRF	Lead (SAL = 500 ppm) LAB	Antimony (SAL = 32 ppm) XRF	Antimony (SAL = 32 ppm) LAB
1st (7/28/94)	AAB 5760	468	640	47	5
	AAB 5831	19	35	31	0.5
	AAB 5866	69	73	35	0.6
2nd (8/19/94)	AAB 7682	639	N/A	120	N/A
	AAB 7682D	625	N/A	105	N/A

N/A = data not available as of 11/13/94

Fig. 5-21-1. Site location map of SWMU 3-003(p) showing locations of previous sample sites and analytical results.

samples were analyzed in the field using PCB test kits. The results for all samples indicated PCB levels were less than the 10 ppm SAL. Soil samples were also field screened for metals using x-ray fluorescence (XRF) analysis; field screening results indicated that antimony concentrations may have been above the SAL (32 ppm) in three samples (47, 35, and 31 ppm) (Fig. 5-21-1). In addition, the lead concentration of one of these samples was 468 ppm, slightly over the revised lead SAL (400 ppm) (EPA 1994, 17-1013). Based on these findings, these three surface soil samples were then submitted for fixed laboratory analysis of antimony and lead. Analytical results from the fixed laboratory indicated that antimony concentrations were below the SAL for these soil samples but lead levels were just over the SAL. Sample locations and analytical results are shown on Fig. 5-21-1.

In response to these data, a second sampling event was initiated to bound the lateral limits of lead contamination. The Phase I investigation/ screening assessment data indicated that the lead concentrations which approached or exceeded SALs appeared to be isolated within a small portion of the unpaved area south of the asphalt. Surface soil samples were then collected from the zero to six-inch depth interval within this isolated area and field screened for lead by XRF analysis. XRF results indicated that soil lead concentrations for one sample were 639 ppm and the corresponding duplicate was 625 ppm. These concentrations exceed the SAL for lead in soil. Laboratory results of 640 ppm lead for this soil sample confirmed the XRF results. The locations and results of this sampling event are shown on Fig. 5-21-1. Based on these results, a 20-square-foot area has been identified as containing elevated lead concentrations within surface soil. The following sampling and analysis plan for SWMU 3-003(p) is designed to define and characterize the spatial distribution of the PCOCs within the 20-square-foot area.

5.21.2 Investigation Approach and Objectives

Investigation activities for this SWMU will focus on detecting the presence and nature of potential contamination in soils within the 20-square-foot area identified in the 1994 investigations. Because the source of contamination is believed to be from equipment that was formerly stored in this area, and the

nature of this contamination is unknown, the PCOCs for this site include TPH, PCBs, SVOCs, VOCs, and Appendix VIII metals.

A biased sampling approach will be used in the 20-square-foot area. Sample locations will be based on previous investigation results, known history of the SWMU, and the PCOC migration potential described in Subsection 5.0.3 of Addendum 1.

5.21.3 Sample Locations and Methods

A total of 4 biased sample locations were selected for sampling at this PRS. The area identified in the 1994 Phase I investigation will be divided into four equally sized quadrants, and a sample site will be located at the center of each quadrant (Fig. 5-21-2). All soil samples will be field screened continuously with a PID/FID for VOCs as described in Subsection 5.0.5 of this work plan. In addition, all samples will be field screened for radiological constituents as described in Subsection 5.0.5 of Addendum 1.

The four soil samples for laboratory analysis will be collected from the 0 to 12-in. interval and from the 12-in. interval immediately above the clay-rich horizon or the soil/tuff interface if no clay-rich horizon is found. An aliquot of soil will be collected from the sample intervals prior to homogenization and submitted for laboratory analysis of TPH and SVOCs. The remainder of each sample interval will be homogenized and then submitted for laboratory analysis of PCB and Appendix VIII metals.

The continuous samples will be collected using LANL-ER-SOP-06.10, R0, the Hand Auger and Thin-Wall Tube Sampler. A split-tube will be used to facilitate sample removal. The adjacent samples for VOC analysis will be collected using a hand auger fitted with a brass sleeve. Specific sample collection procedures are in Appendix D of Addendum 1.

5.21.4 Laboratory Analyses

Soil samples will be analyzed in the laboratory for the constituents described above using appropriate EPA methodology. The number of anticipated samples, their locations, and the types of analyses are summarized in Table 5-21-1. One field duplicate will be submitted for Laboratory analysis as the

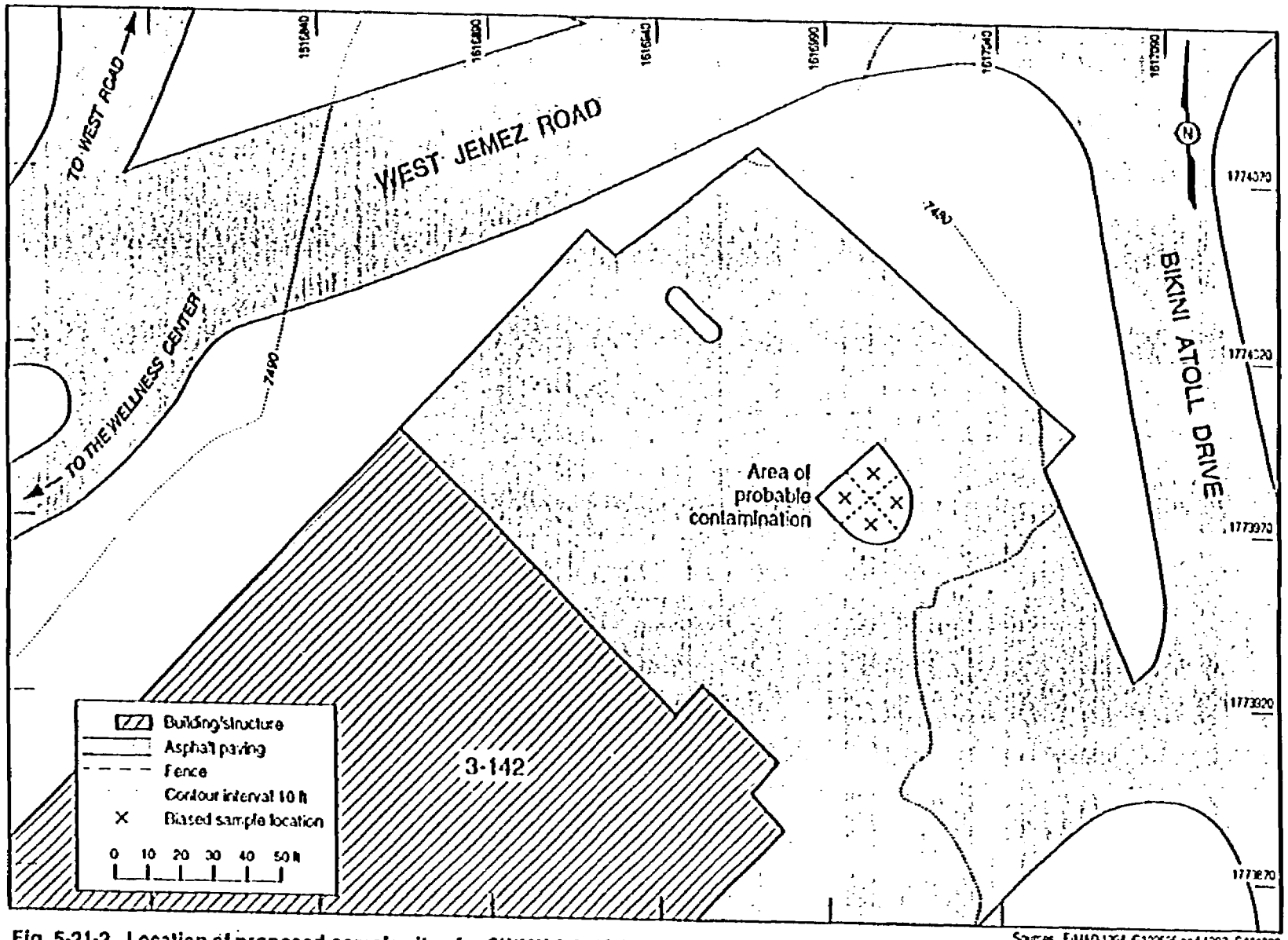


Fig. 5-21-2. Location of proposed sample sites for SWMU 3-003(p).

Sources: FIMAD 1994, G102536 and 1993, G101323
Modified by CARTography by A. Kron 11/13/94

maximum number of QC samples determined by using the guidelines in the site-specific QAPjP, Annex II, Note 2A of Addendum 1. All samples will be prepared and shipped in accordance with LANL ER standard operating procedures for chain-of-custody and transportation as listed in Appendix D of Addendum 1 of this work plan.

TABLE 5-21-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE 1 SAMPLING PLAN SUMMARY OF SWMU 3-003(p) SOIL CONTAMINATION FROM FORMER STORAGE AREA

SAMPLE DESCRIPTION					FIELD SCREEN			LABORATORY ANALYSIS				
								ORGANICS				METALS
SAMPLING LOCATION DESCRIPTION	NO. OF SAMPLE LOCATIONS	SAMPLE DEPTH (IN.)	TOTAL NO. OF SAMPLES	SAMPLE I.D. NUMBER	RADIATION SCREENING[2]	ORGANIC VAPOR SCREENING (PID/FID)	RAD VAN ANALYSIS[3]	VOCs (SW 8240)	SVOCs (SW 8270)	PCBS (SW 8080)	TPH (SW 8015)	APPENDIX VIII METALS (SW 6010, 7000)
20-square-ft area	4	0 - 12	4		4	4	4	4	4	4	4	4
		s/t[4]	4		4	4	4	4	4	4	4	4
QC SAMPLES[1]												
Field Duplicate	1	TBD	1		1	1	1	1	1	1	1	1
Confirmatory samples												
TOTALS	5		9		9	9	9	9	9	9	9	9

[1]QC samples are determined using guidelines outlined in the site-specific QAPjP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.

[2]Gross alpha, beta, and gamma using field instrumentation.

[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.

[4]s/t = soil/tuff interface (12-in. interval above interface).
TBD = To be determined in the field.

SWMU 3-059 and SWMU 3-003(n)

5.22 Salvage Yard Adjacent to TA-3-271

5.22.1 Description and History

The PRSs included in this aggregate are SWMUs 3-059 and SWMU 3-003(n) located adjacent to TA-3-271 (Fig. 5-22-1). SWMU 3-059 is a former salvage yard and SWMU 3-003(n) is a one-time transformer spill from equipment stored in the salvage yard. TA-3-271 is now used by EES-5 as a drill core logging and storage facility, and the adjacent former salvage yard [SWMUs 3-059 and 3-003(n)] is used as a parking lot and a storage area for empty drums.

5.22.1.1 SWMUs 3-059 and 3-003(n)

SWMU 3-059, a former salvage yard, included an approximately 250 ft long x 115 ft wide area located adjacent to the south side of building TA-3-271 and an approximately 100 ft x 60 ft fenced, asphalted area north of the building (Fig. 5-22-1).

The perimeter of the south yard is fenced except for the northern portion that abuts TA-3-271. Most of the south yard is paved with asphalt except for an approximate 50-ft square area in the southwest corner and a small, 15 ft x 20 ft area approximately 50 ft from the southeast corner of TA-3-271 where the asphalt has degraded. Other areas where equipment was stored outside of the fenced yards include: 1) a 20-ft wide area along the western side of the fenced yard; 2) a 20-ft wide area north of the northwest corner of the fenced yard; and 3) a 50 ft x 50 ft unpaved area located along the west side of TA-3-271 [SWMU 3-003(n)], near the northwest corner of the building.

Runoff across the surface of the SWMU drains southeast toward Sandia Canyon. LANL support contractors (Zia, Pan Am, Johnson Controls) used the area of SWMU 3-059 as a salvage yard from the early 1960s through May 1993, when the salvage operation and materials were moved to TA-60-2. This SWMU was used for the storage of transformers, electrical equipment, batteries, and scrap metal pending sale or reuse. All salvage operations were conducted from offices inside TA-3-271. Small and weather-sensitive salvage items were kept inside TA-3-271. All other items were stored in and around the salvage yard adjacent to the south side of the building. Sections of the salvage yard were paved intermittently and some sections remained unpaved until the late 1980s. The exact dates of paving

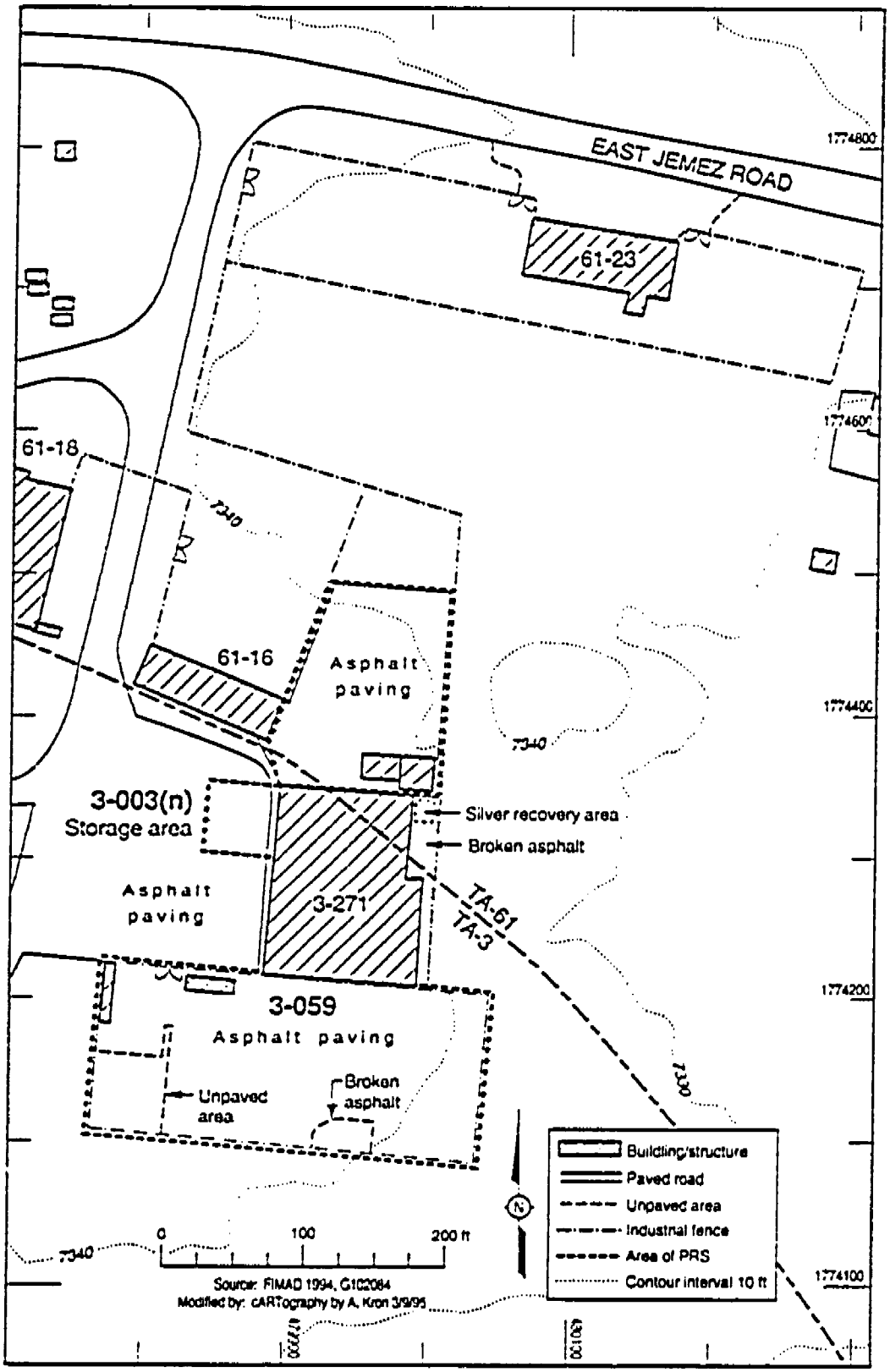


Fig. 5-22-1. Site location map of SWMUs 3-059 and 3-003(n).

could not be determined from a review of aerial photographs or from interviews with site workers.

Review of a 1986 field observation report indicated a single, used car battery leaking acid onto the ground approximately five feet south of the salvage yard fence (LANL 1986, 17-223). Debris was also noted along the east and south sides of the fence. Review of aerial photographs showed soil staining near equipment stored along the inside fence and in other portions of the yard (LASL 1974, ER 0017267; LASL 1977, ER 0017860; LASL 1979, ER 0018923; LANL 1984, ER 0018929; LANL 1986, ER 0018010; LANL 1991, ER 0018135). The extent of hazardous and radioactive material releases from fluids draining from equipment to the soil is unknown.

Aerial photographs indicate that transformers were stored in the area that composes SWMU 3-003(n) from at least 1977 to 1986 (LASL 1977, ER 0017860; LANL 1986, ER 0018010). The area was affected by an oil spill from a transformer that occurred in 1977; the spill area is located approximately 20 ft south of the northwest corner of TA-3-271. The ruptured transformer had a yellow label indicating that it contained between 50 and 500 ppm PCBs. The dimensions of the transformer that ruptured were approximately 3 ft long by 4 ft wide by 8 ft high (LANL 1989, 17-582), so the spill was likely less than 10 gal. in volume. There are conflicting reports as to whether the spill was cleaned up, or if confirmatory sampling was conducted. During an ER Program site reconnaissance visit in 1988, stained soil was observed at the storage area and the 1977 spill location (LANL 1991, 17-323); this staining was not observed in the 1991 aerial photographs (LANL 1991, ER 0018135). In 1991 the drainage pattern west of TA-3-271 was altered by regrading the parking lot and applying base course. The entire area has received additional base course at least once since that time.

In 1993 storm water runoff samples were collected from two locations downslope and southeast of this SWMU and analyzed for radionuclides, metals, cyanide, total phenols, VOCs, and SVOCs (LANL 1993, 17-851). Sample collection sites were located 100 ft northeast of TA-3-271 and 50 ft southeast of the southeast corner of the salvage yard. Review of analytical results shows all concentrations at or below background levels except for one constituent. Results from a sample collected in the runoff area showed one SVOC constituent,

bis(2-ethylhexyl)phthalate, detected at concentrations above the SAL. This constituent is a common analytical laboratory contaminant resulting from the use of plastic sample bottles and/or latex gloves during sample collection or analysis. As a result, bis(2-ethylhexyl)phthalate is not considered a PCOC.

5.22.2 Investigation Approach and Objectives

5.22.2.1 SWMU 3-059 and 3-003(n)

The nature and extent of potential contamination at SWMU 3-059 is not known due to incomplete records and lack of knowledge about common work practices at TA-3-271. Electrical equipment that may have contained PCB-contaminated dielectric fluids, equipment containing hydraulic and lubricating oils, used and damaged batteries, and equipment that may have contained radioactive contaminated fluids possibly released potentially hazardous substances into the environment. PCOCs for this SWMU include PCBs, TPH, SVOCs, and metals. Since radionuclides could have contaminated fluids in the equipment, samples will also be collected for these PCOCs as described in Subsection 5.22.4.2. Although no contamination was found in runoff water samples collected downslope of this SWMU, no soil sampling has taken place within the SWMU boundaries or in the immediate surrounding area.

Sampling activities for SWMU 3-003(n) will focus on detecting the presence and nature of potential contamination in soils where transformers were stored and in the 1977 reported spill area. Because oil potentially containing PCBs was spilled and regrading may have redistributed contamination throughout the unpaved area, PCOCs for SWMU 3-003(n) include TPH, Appendix VIII metals, and PCBs.

Based on review of historical information and aerial photographs, soil contamination is likely to exist at this site. Therefore, the most cost-effective investigation approach for this site is a sampling strategy that satisfies both the purposes of the Phase I investigation (to identify PCOCs and the presence or absence of contamination) and the Phase II investigation (to identify the nature and extent of contamination, if present). Although some additional investigation efforts may be required to further define contamination, this sampling strategy is designed to limit the level of effort that may be required at a later date.

Based on the known spill area of SWMU 3-003(n) and the uncertainty associated with the regrading of the driveway area, biased and random investigatory

sampling methods will be used. Biased sampling will target areas most likely to be contaminated, based on historical information and the factors discussed in Subsection 5.0.3 of Addendum 1. Random sampling will provide greater coverage of the parking lot area, increasing the likelihood that contaminated areas not targeted for biased sampling will be identified.

In order to implement the combined Phase I/Phase II sampling strategy, both biased and random sampling methods will be used to investigate SWMU 3-059. Biased sampling will target areas most likely to be contaminated, based on historical information and the factors discussed in Subsection 5.0.3 of Addendum 1. Random sampling will provide greater coverage of the salvage yard, increasing the likelihood that contaminated areas not targeted for biased sampling will be identified. Realtime analytical techniques (i.e., use of an on-site mobile chemical analysis van) will be used to determine if contamination exists and to bound the outer extent of contamination.

5.22.3 Sample Locations and Methods

5.22.3.1 Random Locations

Before sampling at SWMUs 3-059 and 3-003(n), sampling grids will be generated from which sample sites will be randomly selected at grid nodes. A 25 ft x 25 ft sampling grid will be established within the north and south fenced areas at SWMU 3-059 (Fig. 5-22-2). At SWMU 3-003(n), a 5 ft x 5 ft sampling grid extending from the west wall of TA-3-271, 50 ft to the west and 50 ft south of the northwest corner of TA-3-271 will be used (Fig. 5-22-2). Aerial photographs indicate that this area encompasses the former storage site and the area of the reported spill. The area included in the biased sampling for SWMU 3-003(n) will be excluded from the random sampling grid. A site reconnaissance will be conducted to verify sites selected at each SWMU, followed by a geodetic survey for those grid nodes selected for sampling. Based on review of aerial photographs that showed equipment storage and soil staining, approximately 30% of the south yard and 50% of the north yard of SWMU 3-059 may be contaminated. Approximately 25% of SWMU 3-003(n) may be contaminated based on review of aerial photographs, estimated volume of material spilled from the transformer, and extent of regrading in the area. If these percentages of the SWMU areas are assumed to be contaminated and a 90% level of confidence is desired to detect existing contamination, 13 and 9 sample points will be

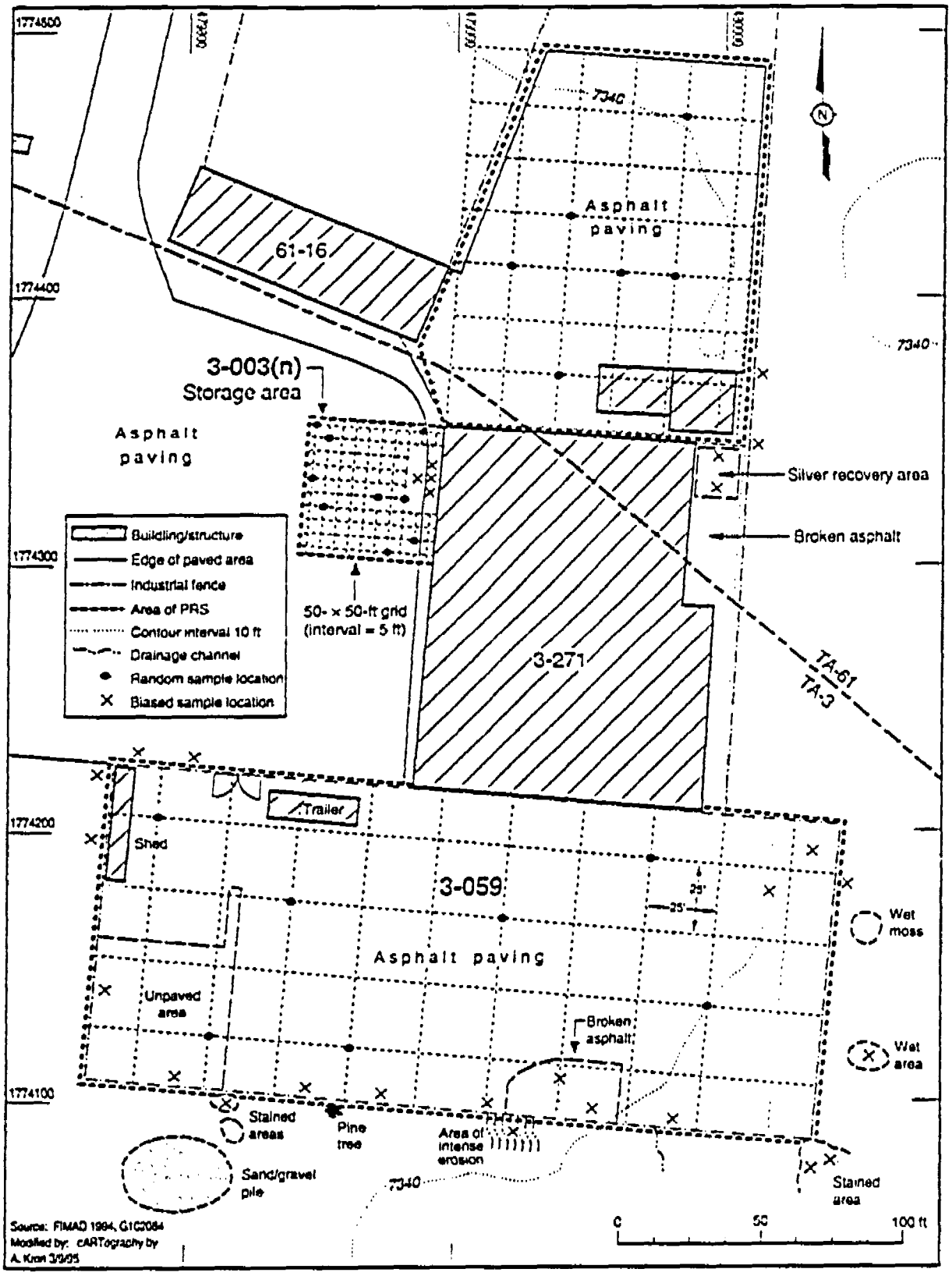


Fig. 5-22-2. Locations of sample sites for SWMUs 3-059 and 3-003(n).

randomly selected at grid nodes at SWMU 3-059 and SWMU 3-003(n), respectively, using the equation discussed in Subsection 5.0.4 of Addendum 1.

5.22.3.2 Biased Locations

Biased sampling to determine the presence and extent of contamination will be conducted at SWMU 3-059, using the on-site mobile chemistry van. Twenty-four biased sample sites have been selected based on documented releases, evidence of soil staining at areas of equipment storage shown in aerial photographs, and area drainage patterns. These sampling locations include seven sample sites located along the southern boundary of the salvage yard inside the fence and four outside the fence, four sites at the east side of the yard (two inside the fence and two outside the fence), five sample sites at the west and northwest side of the yard (four outside the fence and one inside the fence), and four samples located north of TA-3-271 (two in the old silver recovery area and two outside the southeast corner of the fence) (Fig. 5-22-2). To increase the probability of detecting contaminants, additional biased samples may be collected at other locations based on field observations, such as field screening measurements and visual indicators.

Biased soil sampling at SWMU 3-003(n) will be conducted in areas where contamination is most likely to exist. Four biased sample locations have been selected based on documented releases, aerial photographs, and PCOC migration pathways. The biased sample locations include one at the approximate center of the reported spill area (20 ft south of the northwest corner of TA-3-271) and three additional biased samples located 5 ft to the north, south, and west of the central sample location (Fig. 5-22-2). The central north and south samples will be located approximately three feet west of the building, with the westernmost sample located five feet west of the central sample location.

5.22.4 Sample Collection Methods

5.22.4.1 Field Screening

All soil samples from SWMUs 3-059 and 3-003(n) will be field screened and collected for VOCs as described in Subsection 5.0.5 of Addendum 1. Because realtime data are required to implement the Phase II investigation at SWMU 3-059, the mobile chemistry van will be on site. Adjacent samples from areas with positive VOC screening readings from both SWMUs will be submitted to the on-site

mobile chemistry van for VOC analysis. All soil samples collected at SWMU 3-003(n) will be screened for radiological constituents as described in Subsection 5.0.5 of Addendum 1.

5.22.4.2 SWMU 3-059

All soil and asphalt samples from SWMU 3-059 will be field screened for radioactive contamination as described in Subsection 5.0.5 of this work plan. If the radioactivity field screening results are three standard deviations or more above background for a sample, it will be submitted for laboratory analysis for gross alpha/beta analysis, gamma spectroscopy, and tritium. If radiological constituents are not detected as described above, 10% of the sampling sites for each media will be randomly selected for confirmatory sampling. In no case will fewer than two confirmatory samples be collected. These samples will be sent to a fixed laboratory for confirmatory gross alpha/beta analysis, gamma spectroscopy, and tritium analysis.

If an asphalt cover exists at a sample location, the asphalt will also be sampled prior to sampling soil under the asphalt. Asphalt samples will be analyzed for PCBs only because it is likely that other constituents have washed from the asphalt surface. A maximum of 20 asphalt samples (12 random locations and 8 biased locations) will be collected. After the asphalt has been sampled, the base course underlying the asphalt will be removed using a stainless steel shovel. Soil sample collection will be performed as described below.

Soil samples from SWMU 3-059 will be collected from the 0 to 12-in. interval. Each sample interval will be homogenized and then submitted to the on-site mobile chemical analysis van for XRF metals in soil and PCB analyses in soil and asphalt. An aliquot of soil will be collected from the sample intervals prior to homogenization and submitted for laboratory analysis of SVOCs and TPH. For samples collected under asphalt, SVOC and TPH analysis will only be conducted on soils below the 12-in. depth to decrease the potential for false positives obtained as a result of the asphalt cover.

If mobile chemistry van analyses identify PCBs, SVOCs, TPH, or metals in soils above SALs at a sample location, then additional soil samples will be collected in 12-in. intervals to the clay-rich horizon or the soil-tuff interface if no clay-rich horizon is found. If chemical van analysis identifies that PCBs, SVOCs, TPH and

metals are not present above SALs at the 0 to 12-in. depth, 10% of all sampling sites will be randomly selected for confirmatory sampling. In no case will fewer than two confirmatory samples be collected and they will be collected in the same manner as previously described. These samples will be submitted to a fixed laboratory for analysis of PCBs, SVOCs, TPH, and Appendix VIII metals. In addition, 10% of the metals samples found to be over SALs by the field laboratory will be submitted to a fixed lab for confirmatory analyses.

5.22.4.3 SWMU 3-003(n)

The thirteen soil samples from SWMU 3-003(n) will be collected from the 0 to 12-in. soil depth interval beneath the base course, which will be removed prior to sample collection. An aliquot of soil will be collected from the sample intervals prior to homogenization and submitted for field laboratory analysis of TPH. The remainder of each sample interval will be homogenized and then submitted for field laboratory analysis of Appendix VIII metals and PCBs.

If mobile chemistry van analyses identify PCBs, TPH, or metals in soils above SALs at a sample location, then additional soil samples will be collected from the interval immediately above the clay-rich horizon or the soil-tuff interface if no clay-rich horizon is found. If chemical van analysis identifies that PCBs, TPH, and metals are not present above SALs at the 0 to 12-in. depth, 10% of all sampling sites will be randomly selected for confirmatory sampling. In no case will fewer than two confirmatory samples be collected and they will be collected in the same manner as previously described. These samples will be submitted to a fixed laboratory for analysis of PCBs, TPH, and Appendix VIII metals. In addition, 10% of the metals samples found to be over SALs by the field laboratory will be submitted to a fixed lab for confirmatory analyses.

5.22.4.4 SOP Methods

For all sample locations at both SWMUs, soil samples from the accessible surface soil and from soil immediately beneath the asphalt at SWMU 3-059 and from immediately below the base course at SWMU 3-003(n) will be collected using LANL-ER-SOP-06.09, R0, Spade and Scoop Method for Collection of Soil Samples. The subsurface soil samples (12-in. depth to clay-rich horizon or soil-tuff interface), TPH samples, and adjacent VOC samples will be collected using LANL-ER-SOP-06.10, R0, Hand Auger and Thin-Wall Tube Sampler. A split tube

will be used to facilitate subsurface soil sample removal. Adjacent VOC samples will be collected using a hand auger fitted with a brass sleeve. Asphalt will be sampled using LANL-ER-SOP-06.28, R0, Chip Sampling of Porous Surfaces Method. Specific procedures to be followed in the field for sample collection are discussed in Appendix D of Addendum 1.

5.~~22~~19.5 Laboratory Analyses

5.~~22~~19.5.1 SWMU 3-059

At SWMU 3-059 asphalt chip samples will be submitted for field laboratory analysis of PCBs. Confirmatory soil samples will be submitted for fixed laboratory analysis of PCBs, SVOCs, TPH, VOCs, and Appendix VIII metals using appropriate EPA methodology. All other soil samples will be submitted to an on-site mobile chemical analysis van. Soils will be analyzed at the van for PCBs by SW-846 Method 8080, SVOCs by SW-846 Method 8270, TPH by SW-846 Method 418.1, VOCs by SW-846 Method 8260, and metals by XRF. Samples identified for radioactivity analysis will be submitted to a fixed laboratory for confirmatory gross alpha/beta analysis, gamma spectroscopy, and tritium analysis.

The number of anticipated samples, associated locations, and the EPA method of analyses are summarized in Table 5-22-1. One field duplicate, one rinsate blank, and one collocated sample will be collected and submitted as a maximum number of QC samples as determined using the guidelines in the site-specific QAPjP, Annex II, Note 2A of Addendum 1. One trip blank will be submitted for VOC analyses. Specific sample collection procedures that must be followed are discussed in Appendix D of Addendum 1.

5.~~22~~19.5.2 SWMU 3-003(n)

Soil samples from SWMU 3-003(n) will be submitted to the field laboratory for analysis of TPH, Appendix VIII metals, and PCBs. Collocated samples will be analyzed for VOCs using appropriate EPA methodology. In addition, 10% of the metals samples found to be over SALs by the field lab will be submitted to a fixed lab for confirmatory analysis. The number of anticipated samples, their locations, and the EPA methods of analyses are summarized in Table 5-22-1. All samples will be prepared and shipped in accordance with LANL ER standard operating procedures for chain-of-custody and transportation as listed in Appendix D of Addendum 1.

TABLE 5-22-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMUs 3-059 AND 3-003(n) FORMER JCI SALVAGE YARD

SAMPLE DESCRIPTION					FIELD SCREEN			FIELD LABORATORY ANALYSIS					FIXED LABORATORY ANALYSIS					
								ORGANICS				METALS		ORGANICS			METALS	
SAMPLING LOCATION DESCRIPTION	NO. OF SAMPLE LOCATIONS	SAMPLE DEPTH (IN)	TOTAL NO. OF SAMPLES	SAMPLE I.D. NUMBER	RADIATION SCREENING[1]	ORGANIC VAPOR SCREENING (PID/FID)	RAD VAN ANALYSIS[2]	VOCs (SW 8240)	SVOCs (SW 8270)	PCBs (SW 8080)	TPH (SW 418.1)	APPENDIX VIII METALS XRF OR LIBS	GROSS ALPHA/BETA, GAMMA SPEC/TRITIUM	VOCs (SW 8240)[3]	SVOCs (SW 8270)[3]	TPH (SW 418.1)[3]	PCBs (SW 8080)[3] APPENDIX VIII	METALS (SW 6010, 7000)[3]
SWMU 3-059																		
Biased sampling	8	Asphalt	8		8	8	8			8								
	24	0 - 12	24		24	24	24		16	24	16	24						
		12 - 24[4]	24		24	24	24		24	24	24	24						
Random sampling	12	Asphalt	12		12	12	12			12								
	13	0 - 12	13		13	13	13		1	13	1	13						
		12 - 24[4]	13		13	13	13		13	13	13	13						
Confirmatory samples	3	TBD	3		3	3	3	3					3	3	2	3	3	3
SWMU 3-003(n)																		
Biased sampling	4	0 - 12	4							4	4	4						
		s1	4							4	4	4						
Random sampling	9	0 - 12	9							9	9	9						
		s1	9							9	9	9						
Confirmatory samples	2	TBD	2		2	2	2	2						2		2	2	2
QC SAMPLES[5]																		
Trip Blank	NA	NA	1											1				
Field Duplicate	1	TBD	1		1	1	1		1	1		1						
Field Collocated	1	TBD	1		1	1	1		1	1		1						
Rinsate Blank	NA	NA	1											1	1			1
TOTALS	77		129		101	101	101	5	56	122	80	102	3	7	3	5	5	6

QC samples are determined using guidelines outlined in the site specific QAPJP, Annex II, note 2A of this workplan. Location determined by the Field Team Leader.

[1]Gross alpha, beta, and gamma using field instrumentation

[2]Gross alpha, beta, and gamma using mobile laboratory instrumentation

[4]Samples between the 0 to 12-in. soil interval and the s1 interface will only be collected if constituents were found in the prior depth interval

[5]Confirmation samples will be collected and submitted to a fixed laboratory if no constituents are found in the first soil interval sampled for each PCOC

NA = Not applicable

TBD = To be determined in field

SWMU 3-001(i): Two Former Equipment Storage Areas

5.~~23~~20 ~~Asphalt Batch Plant SWMU Aggregate~~

Margaret: Sorry for this mess! I believe all these PRSs will be removed from Ch. 5.

5.~~23~~20.1 Description and History

The Asphalt Batch Plant SWMU aggregate consists of 22 SWMUs all located in the immediate vicinity of the plant. The asphalt batch plant was moved from a location near the airport to the complex southwest of the Physics Building in 1953, and then to its present location in the northeast corner of TA-3 in 1954 (ENG-7 building records). An office building (TA-3-70) was built directly northeast of the batch plant in July 1954 to house Zia Company Roads and Grounds staff. The plant is currently operated by Johnson Controls, Inc. (JCI). All but ~~four~~ one PRSs [SWMUs 3-001(i), 3-029(b), 3-036(b), and C-3-015] at the plant are proposed for no further action ~~(NFA) in Chapter 6~~ of this work plan. → now DAs in Ch. 6

Actually, not sure about this one because of SWMU designation vs. AOC label.

A typical scenario for asphalt batch production and usage begins with bulk aggregate, including various sizes and grades of gravel and sand, being passed through a dryer to remove moisture and then placed into the pugmill. Liquid 85-100 asphalt emulsion stored in a heated aboveground tank adjacent to the batch plant is then pumped into the pugmill and mixed with the aggregate. To prevent sticking, dump trucks are sprayed with a thin coating of diesel fuel #2 (kerosene was used until 1989) and then asphalt from the pugmill is loaded into the truck and transported to the job site.

While the asphalt batch is being prepared, the oil distributor truck is filled with heated asphalt emulsion (85-100 oil). To ensure the asphalt adheres to the surface, this oil is applied to the surface being paved before the asphalt is applied. Upon returning to the batch plant, each dump truck is again sprayed with a small quantity of diesel fuel #2 to remove residual asphalt. Residual diesel fuel and asphalt are collected in an aboveground metal tank. Diesel fuel (kerosene was used prior to 1989) is also used to clean the applicator on the oil distributor truck. Residual oil from the distributor and diesel fuel are collected in a small, buried metal bin. ✓ en-dash

Materials used in asphalt batch operations include: aggregate, asphalt, asphalt emulsion, asphalt cement, asphalt rubber, diesel fuel #2, and asphalt crack sealer. Diesel fuel #2 replaced kerosene which had been used to coat asphalt dump trucks and clean the oil distributor truck from the mid-1970s until 1989.

Components of these materials include asphalt, petroleum hydrocarbons, water, and light distillates (kerosene).

The PRSs ~~included~~ in this aggregate ~~are~~ is SWMUs 3-001(i), ~~3-029(b),~~ and ~~3-036(b) and area of concern C-3-016.~~ These PRSs will be investigated using a single sampling plan because they are associated with the asphalt batch plant, TA-3-73 (Fig. 5-23-1), and have similar PCOCs. The remaining PRSs at the asphalt batch plant are proposed for NFA in Chapter 6 of this work plan.

SWMU 3-001(i) consists of two former material and equipment storage areas located near TA-3-70, the JCI Roads and Grounds office building. Both areas remain inactive. Storage area #1 is proposed for NFA in Chapter 6. Storage area #2 located directly northeast of TA-3-70, requires investigation (Fig. 5-23-2). Storage area #2 measures approximately 50 ft by 150 ft on level, unpaved ground. It was used by LANL support contractors between the early 1970s and approximately 1989 as a staging area for old transformers, barrels of roofing compound, tars, and roofing adhesives (LANL 1994, 17-1172). Bagged and labeled asbestos materials were also stored in dumpsters before disposal at the Los Alamos County landfill (LANL 1993, 17-964). There are no staining or documented releases for this area, however workers from the adjacent salvage yard confirm that the salvaged transformers often contained PCBs, and small spills or leaks from the loading and unloading process may not have been documented.

C-3-016 is an oil distributor cleanout bin with a hinged lid. The metal bin measures approximately 4 ft wide x 16 ft long x 3 ft deep, and is buried so that the top is flush with the ground surface (Fig. 5-23-3). According to JCI Roads and Grounds staff, the tank was installed in the mid-1970s (LANL 1994, 17-1172). It contained unused asphalt emulsion oil applied to roads before application of asphalt and for asphalt rejuvenation. Diesel fuel #2 (kerosene was used prior to 1989) is used to clean the oil distributor on the truck. The oil mixture in the tank is regularly pumped out and recycled by Mesa Oil of Albuquerque. Aerial photographs from the 1970s and early 1980s and subsequent site visits by ER Project personnel show extensive stains in the immediate vicinity of the oil distributor cleanout bin that resulted from splashing of oil emulsion, kerosene, and diesel fuel #2 during cleaning

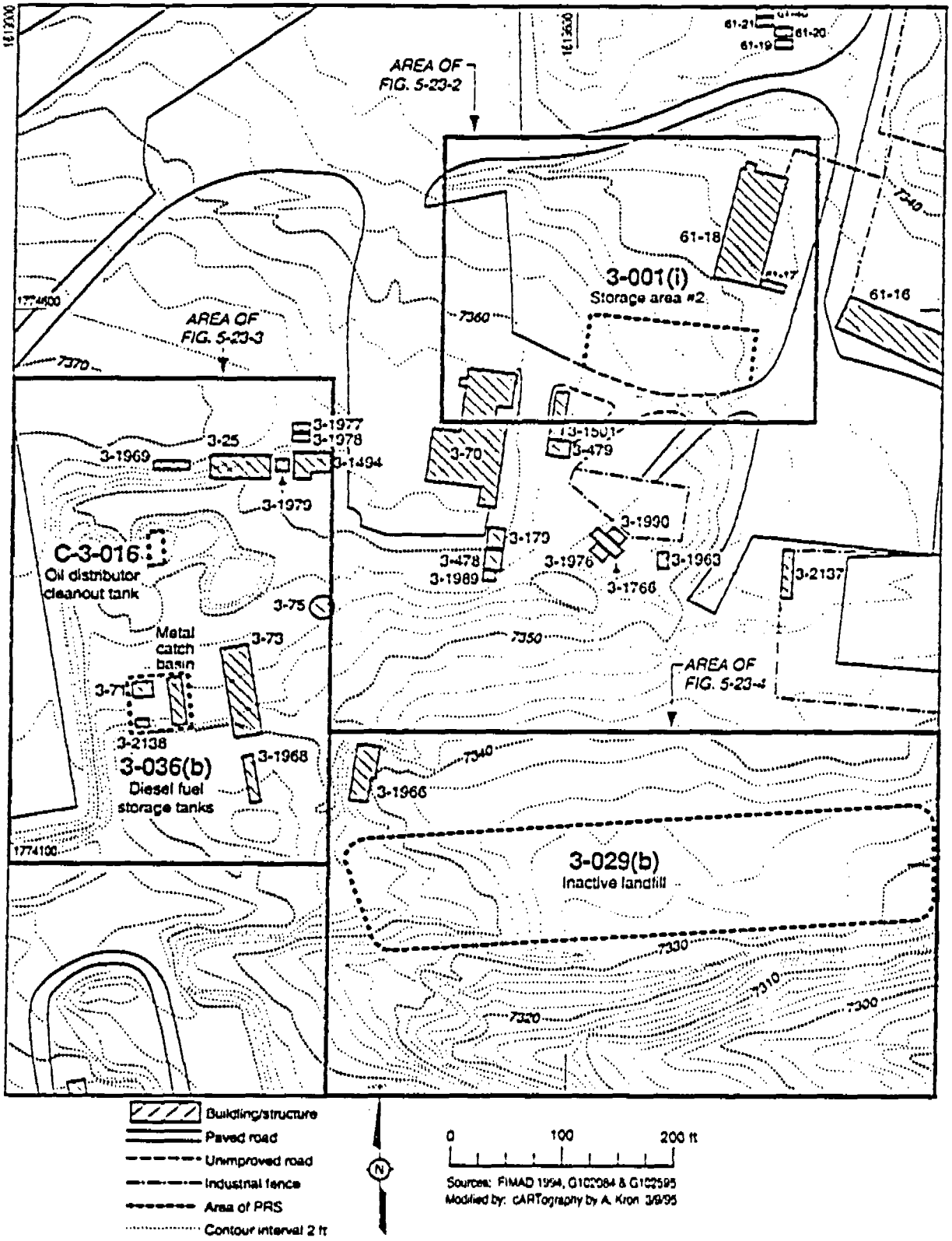


Fig. 5-23-1. Site location map of SWMU 3-001(i), SWMU 3-029(b), C-3-016 and C-3-036(b).

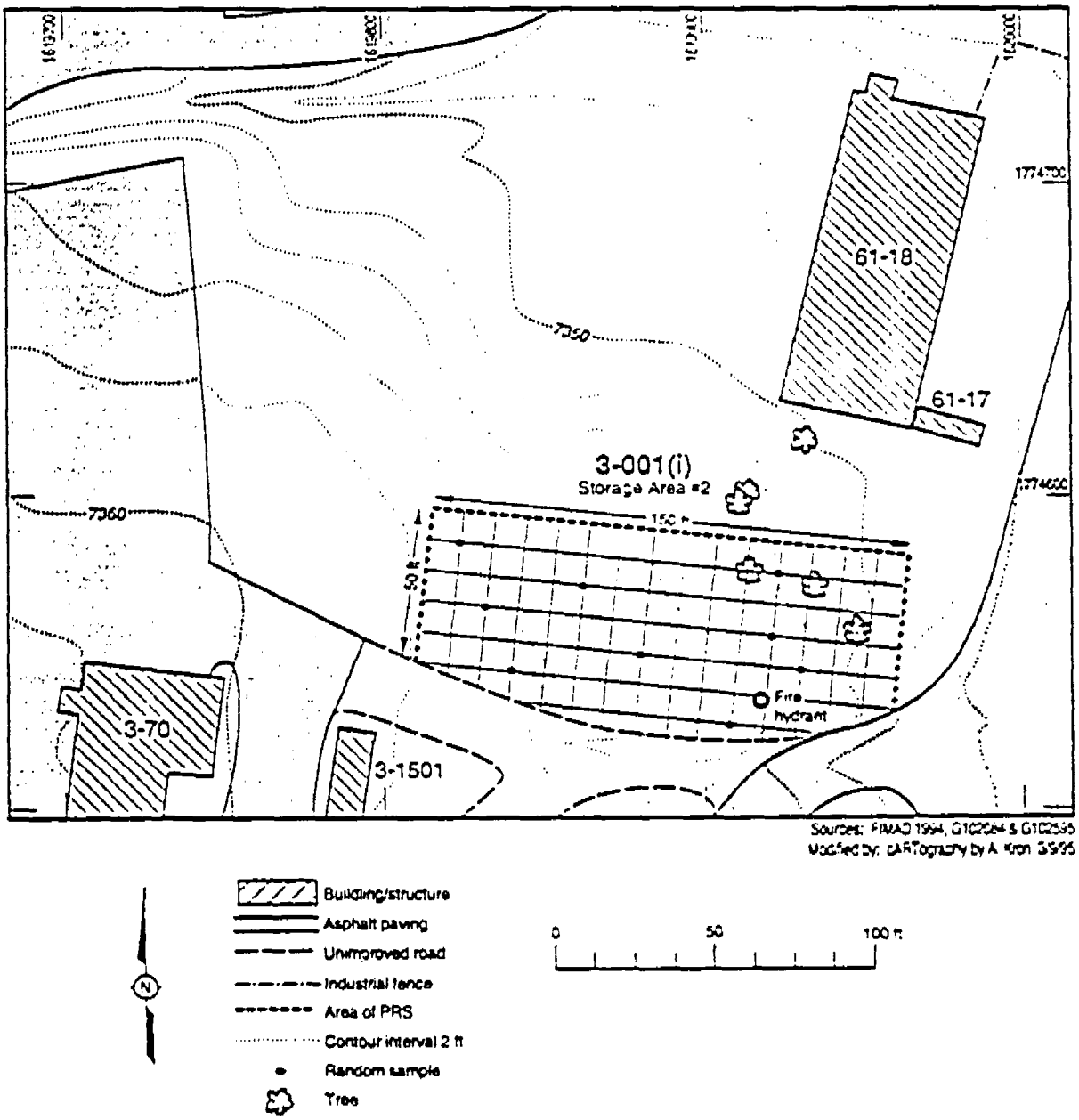


Fig. 5-23-2. Location of sample sites for SWMU 3-001(i).

Fig. 5-23-3. Location of sample sites for C-3-016 and C-3-036(b).

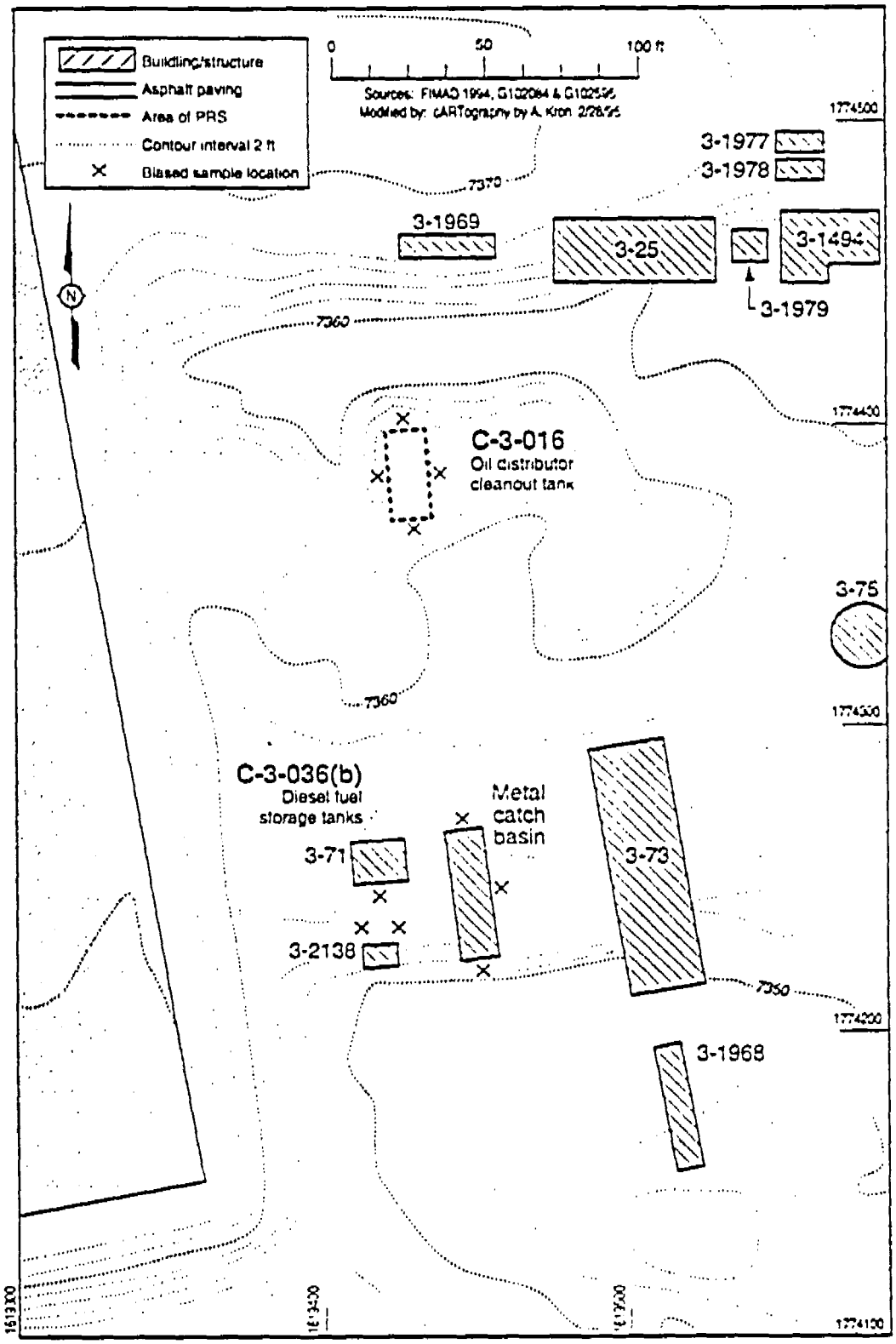


Fig. 5-23-3. Location of sample sites for C-3-016 and C-3-036(b).

5.23.4 Laboratory Analyses

Soil samples collected from storage area #2 of SWMU 3-001(i) will be analyzed in the laboratory for PCBs, TPH, and VOCs using appropriate EPA methodology. Surface and subsurface samples collected from soils surrounding the oil distributor cleanout bin (C-3-016), surface and near-surface soils around the aboveground storage tanks [SWMU 3-036(b)], and subsurface soil samples from SWMU 3-029(b) will be analyzed for TPH, SVOCs, and VOCs using appropriate EPA methodology. The number of anticipated samples, their locations and types of analyses are summarized in Table 5-23-1. QC samples will be submitted from each SWMU and AOC in this aggregate as determined by the FTL, the total number submitted for this aggregate are as follows: two rinsate blanks, two field duplicates and two collocated samples will be submitted for analyses as a maximum number of QC samples determined by using the guidelines in the site-specific QAPjP, Annex II, Note 2A of Addendum 1. One trip blank will be submitted for VOC analyses. All samples will be prepared and shipped in accordance with LANL ER standard operating procedures for chain-of-custody and transportation as listed in Appendix D of Addendum 1.

of the oil applicator (LASL 1974, ER 0017267; LASL 1977, ER 0017860; LANL 1979; ER 0018923; LANL 1983, ER 0018925; LANL 1984, ER 0018929; LANL 1986, ER 0018010; LANL 1991; ER 0018135). The tank was empty during a site visit in January 1994; however, staining was observed beneath the gravel cover surrounding the tank (LANL 1994, 17-1209).

SWMU 3-036(b) consists of two, small #2 diesel fuel aboveground storage tanks (25- to 50- gal. capacity) surrounded by a 3-ft soil berm located 100 ft west of TA-3-73 (Fig. 5-23-3). Diesel fuel from the small tanks is applied to dump truck beds prior to asphalt loading to prevent sticking. The diesel fuel is applied with a small pesticide applicator sprayer to minimize quantities used. An aboveground metal catch basin located adjacent to the east side of the berm collects residual diesel fuel from the truck beds. The diesel fuel is periodically recycled by Mesa Oil of Albuquerque. Before 1989, kerosene was stored in these tanks and applied in the same fashion to truck beds to prevent asphalt from sticking. Historic aerial photographs reveal no visible staining in the area, and with the exception of minor, periodic drips and splashes from the tanks create dark stains just under the top layer of loose gravel, however, JCI Roads and Grounds staff stated there is no record of release from these tanks (LANL 1994, 17-1209).

~~SWMUs 3-029~~(b) and 3-009(a) are an inactive landfill approximately 300 ft x 300 ft x 20 ft deep located 300 ft south of TA-3-73 and TA-2-271 near the rim of Sandia Canyon. JCI Roads and Grounds staff indicated that the landfill was used to extend the mesa rim along the south portion of the batch plant property (LANL 1994, 17-1209). Soil and trees, old asphalt and concrete, partial unused loads of asphalt, residual asphalt emulsion, and kerosene and asphalt oil from the periodic cleaning of the oil applicator on the distributor truck were placed in this landfill. Review of aerial photographs from the mid-1970s and early 1980s indicates the presence of small, unlined pits of asphalt wastes (asphalt, emulsion oil, etc.) along the edge of Sandia Canyon in the fill area (LASL 1974, ER 0017267; LASL 1977, ER 0017860; LANL 1979; ER 0018923; LANL 1983, ER 0018925; LANL 1984, ER 0018929; LANL 1986, ER 0018010; LANL 1991; ER 0018135). The 1986 CEARP survey team noted several inches of liquid in an unlined pit marked "asphalt sealer and accumulation point" (DOE 1987, 0264). Excess asphalt and residual oil emulsion from the plant were disposed in these pits which were then covered with sand and other fill material (LANL 1990, 0145). Some of this mixture was periodically scraped off and disposed in the Los Alamos Municipal Landfill.

The rest was used as fill to increase the entire surface area along the south rim of Sandia Canyon. The fill area is currently used to store aggregate piles for asphalt.

November 2, 1990, the New Mexico Environmental Improvement Division (NMEID) issued LANL a notice of violation concerning pieces of asphalt and an oily sheen found in the Sandia Canyon watercourse below the asphalt batch plant. These items meet the definition of refuse in the New Mexico Water Quality Control Commissions Regulations that prohibit disposal of refuse in a watercourse. The pieces of asphalt and oily sheen were the result of asphalt disposal practices along the rim of Sandia Canyon just south of the asphalt batch plant yard. LANL submitted a corrective action plan to NMEID in November 1990, and the plan was approved December 12, 1990. Cleanup was initiated in early 1991 and continued through early 1994. The corrective action included removing old pieces of asphalt within the drainage and on the associated slope, regrading the entire watercourse and slopes to support vegetation, extending the culvert from the storm drain [SWMU 3-045(g)] approximately 50 ft down the drainage, constructing a berm to prevent additional exposure of asphalt buried in the fill, seeding grasses, and maintaining dense grass cover on all fill slopes and disturbed areas. This work was recently completed and LANL is awaiting final approval from NMED on the completion of the corrective action. Additionally, water samples were collected from the storm drain and results indicate that oil, grease, or other compounds typically associated with asphalt plant operations were not present (LANL 1992, 17-1174).

5.~~25~~20.2 Investigation Approach and Objectives

Investigation activities for this aggregate will focus on detecting the presence and nature of potential contamination in surface soils of SWMUs 3-001(i) and 3-036(b), and in surface and subsurface soils of C-3-016 and SWMU 3-029(b).

Electrical equipment stored in storage area #2 of SWMU 3-001(i) may have released PCB-contaminated dielectric fluids and the drums of roofing materials may have leaked; however, the nature and extent of any potential contamination at storage area #2 is unknown. Random sampling methods will be used to provide coverage of the entire storage area, increasing the likelihood that contaminated areas will be identified. PCOCs for storage area #2 of SWMU 3-001(i) are PCBs, TPH, and VOCs [specifically benzene, toluene, ethylbenzene, and xylene

(BTEX) components] of petroleum products (found primarily in the naphtha in roofing adhesives and sealers). Asbestos is not a PCOC because it was properly double-bagged and stored in dumpsters while in this area (LANL 1993, 17-964).

Biased sampling methods will be used to investigate SWMUs 3-036(b) and 3-029(b) and area of concern C-3-016. Biased sampling will target areas most likely to be contaminated based on historical information and observations of site uses. Because components of the asphalt process (asphalt, oil emulsion, kerosene, diesel fuel #2, and asphalt sealer) were released in varying quantities at the remaining sites in this aggregate, the PCOCs include TPH, SVOCs, and VOCs (specifically BTEX).

Biased sampling will be conducted within both surface and subsurface soils surrounding the oil distributor cleanout tank (C-3-016) to determine if a release has occurred from the tank itself and if residual oil, kerosene, and/or diesel remain in surface and subsurface soils. It is not known whether the metal oil distributor cleanout bin ever leaked and only surficial contamination in the vicinity of the bin is visible in historic aerial photographs of the asphalt batch plant (LASL 1974, ER 0017267; LASL 1977, ER 0017860; LANL 1979; ER 0018923; LANL 1983, ER 0018925, LANL 1984, ER 0018929; LANL 1986, ER 0018010; LANL 1991; ER 0018135).

Biased sampling will be conducted for SWMU 3-036(b) in soils within the bermed area surrounding the aboveground diesel storage tanks, and around the diesel collection tank just east of the bermed area. Both surface and near-surface soils in the immediate vicinity of the aboveground storage tanks and diesel collection tank will be sampled to determine if contamination from periodic drips and splashes of kerosene and diesel fuel #2 remain in concentrations greater than residual levels.

Because the area covered by SWMU 3-029(b) is extensive and the PCOCs are most likely to be dispersed in the fill among asphalt, concrete, and landscape debris, biased sampling will be conducted with the excavation of at least two trenches across the fill area. The trenches will be excavated at locations in the western portion of the fill area along Sandia Canyon where historic aerial photographs and JCI Roads and Grounds staff indicate the greatest likelihood of finding the PCOCs. Biased sampling will be conducted within subsurface soils and obvious asphalt-related wastes to determine if previous releases of asphalt-

related materials (residual oil emulsion, asphalt, asphalt sealer, kerosene and/or diesel) remain in concentrations that pose an unacceptable risk to human health and/or the environment.

5.~~23~~20.3 Sample Locations and Methods

5.~~23~~20.3.1 SWMU 3-001(i)

Samples at storage area #2 of SWMU 3-001(i) will be randomly selected from 10 ft x 10 ft sampling grid. Based on the potential quantity of dielectric fluid released from transformers temporarily stored in the area, it is assumed that no more than 25% of the area covered by the grid may be contaminated. If 25% of the area covered by the sample grid is assumed to be contaminated and a 90% confidence level is desired for detection of potential contaminants, 9 sample points will be randomly selected at grid nodes based on the equation discussed in Subsection 5.0.3 of Addendum 1. A site reconnaissance will be conducted to verify sites selected and a geodetic survey will be conducted for those grid nodes selected for sampling (Fig. 5-23-2).

The nine soil samples will be field screened for VOCs and radiological constituents as described in Subsection 5.0.5 of Addendum 1. The random soil samples at SWMU 3-001(i) will be collected from the 0 to 12-in. depth interval. An aliquot of soil will be collected from the sample intervals prior to homogenization and submitted for laboratory analysis of TPH. The remainder of each sample interval will be homogenized and then submitted for laboratory analysis of PCBs. An adjacent sample will be collected from the 6 to 12-in. interval and submitted for VOC analysis.

Soil samples will be collected using LANL-ER-SOP-06.09, R0, the Spade and Scoop Sampling Method for Collection of Soil Samples and LANL-ER-SOP-06.10, R0, the Hand Auger and Thin-Wall Tube Sampler. A split tube will be used to facilitate sample removal.

5.~~23~~20.3.2 C-3-016

Prior to initiation of sampling activities at C-3-016, the bin will be cleaned out by Johnson Controls World Services, Inc. (JCI) and inspected for any breach in the integrity of the metal. Additionally, the tank will be filled with water to determine if it leaks. Biased sampling will be conducted at soil depths where potential

contamination is most likely to exist if the bin leaked and from oil distributor cleaning practices. Both surface and subsurface samples will be collected from four sample locations located at the approximate center point on each side of the bin, and approximately three to four feet from the edge of the bin (Fig. 5-23-3).

All soil samples will be field screened for VOCs and radiological constituents as described in Subsection 5.0.5 of Addendum 1. Because PCOCs may have accumulated in surface soils and may be present in subsurface soil below the bin (from leaks), soil samples will be collected continuously using a hand auger in 12-in. intervals from the surface to a depth of 4 ft. The four-foot target depth will provide sample materials from a soil interval that is adjacent to the bottom of the buried cleanout bin. All 12-in. intervals will be visually examined for contamination. One sample will be collected for laboratory analysis from the 0 to 12-in. interval and from the three to four-foot interval. Each interval collected will be submitted for laboratory analysis of TPH, SVOCs, and VOCs. If contamination is detected either visually or with the PID/FID or field laboratory at the four-foot depth, the hand auger will be advanced to a depth where contamination is no longer detected or soil/tuff interface. If sampling becomes prohibitive with the hand auger, an alternative method will be employed. One confirmatory sample from the final six-inch interval at each location will be collected and submitted for laboratory analysis of TPH, SVOCs, and VOCs.

The continuous soil samples will be collected using LANL-ER-SOP-06.10, R0, the Hand Auger and Thin-Wall Tube Sampler. A split tube will be used to facilitate sample removal.

5.23.3.3 3-036(b)

Figure 5-23-3 identifies the six sample locations (to be located in obviously stained areas) that will be used to determine the presence of PCOCs in concentrations above SALs at 3-036(b). Before initiating sampling activities at this site, a reconnaissance visit will be conducted to identify sample locations in stained soils, beneath diesel storage tank valves, and around the diesel fuel collection tank. All soil samples will be field screened for VOCs and radiological constituents as described in Subsection 5.0.5 of Addendum 1. Soil samples will be collected at biased locations from the 0 to 12-in. depth interval using LANL-ER-SOP-06.09, R0, the Spade and Scoop Method for Collection of Soil Samples. These samples will be submitted for field laboratory analysis of TPH,

SVOCs, and VOCs. If contamination is detected either visually or with the PID/FID or field laboratory, the hand auger will be advanced to a depth where contamination is no longer detected or soil/tuff interface. If sampling becomes prohibitive for the hand auger method an alternative method will be employed. One confirmatory sample from the final six-inch interval at each location will be collected and submitted for laboratory analysis of TPH, SVOCs, and VOCs.

5.23.3.4 SWMU 3-029(b)

Site characterization of SWMU 3-029(b) will involve excavation of a minimum of three trenches across the inactive landfill where asphalt-related wastes were known to have been disposed (Fig. 5-23-4). The trenches will be 40 to 50 ft long and are expected to be approximately 15 ft deep. Each trench will be divided into two equal segments, each segment will be excavated in three 5-ft thick lifts to a depth of 15 ft, and a biased sample will be collected from each lift. Each sample will be field screened for VOCs and radiological constituents as specified in Subsection 5.0.5 of Addendum 1. For VOC samples an adjacent sample will be collected from the same area of the backhoe bucket as the grab sample and containerized in a glass jar.

Non-asphalt related fill material will be separated from asphalt and petroleum wastes and will be stockpiled adjacent to or away from each trench. Provided this material does not exhibit any signs of contamination when measured with the PID/FID, it will be returned to the excavation upon completion of sampling. A minimum of six soil samples from each trench (two from each five ft depth), visibly contaminated with asphalt and petroleum-related waste will be collected from the center of the backhoe bucket in a representative manner in accordance with LANL-ER-SOP-06.09, R0, the Spade and Scoop Method for Collection of Soil Samples. Additional samples may be collected in the event field screening results and visual observations show the presence of anomalies. Each sample will be submitted for laboratory analysis of TPH, SVOCs, and VOCs.

Exact sample locations and depth will be determined in the field based on visible contamination and PID/FID readings. Specific procedures to be followed in the field for sample collection at each site in the asphalt batch plant aggregate are discussed in Appendix D of Addendum 1.

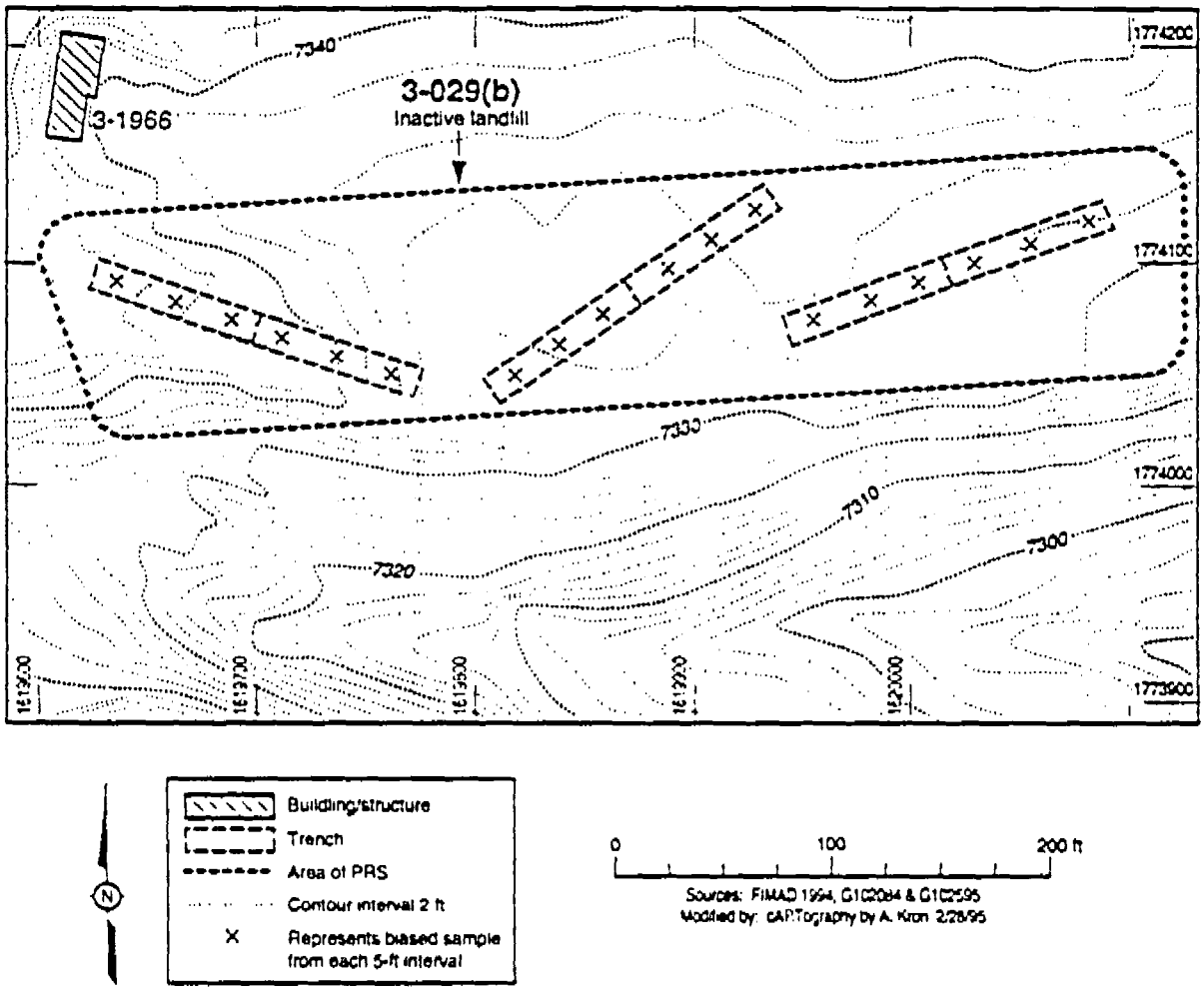


Fig. 5-23-4. Location of sample sites for SWMU 3-029(b).

5.23.4 Laboratory Analyses

Soil samples collected from storage area #2 of SWMU 3-001(i) will be analyzed in the laboratory for PCBs, TPH, and VOCs using appropriate EPA methodology. Surface and subsurface samples collected from soils surrounding the oil distributor cleanout bin (C-3-016), surface and near-surface soils around the aboveground storage tanks [SWMU 3-036(b)], and subsurface soil samples from SWMU 3-029(b) will be analyzed for TPH, SVOCs, and VOCs using appropriate EPA methodology. The number of anticipated samples, their locations and types of analyses are summarized in Table 5-23-1. QC samples will be submitted from each SWMU and AOC in this aggregate as determined by the FTL, the total number submitted for this aggregate are as follows: two rinsate blanks, two field duplicates and two collocated samples will be submitted for analyses as a maximum number of QC samples determined by using the guidelines in the site-specific QAPjP, Annex II, Note 2A of Addendum 1. One trip blank will be submitted for VOC analyses. All samples will be prepared and shipped in accordance with LANL ER standard operating procedures for chain-of-custody and transportation as listed in Appendix D of Addendum 1.

TABLE 5-23-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE 1 SAMPLING PLAN SUMMARY OF SWMU 3-001(i), 3-029(b), 3-036(b), and C-3-016 ASPHALT BATCH PLANT AGGREGATE

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LAB ANALYSIS			
								ORGANICS			
SAMPLING LOCATION DESCRIPTION	NO. OF SAMPLE LOCATIONS	SAMPLE DEPTH (IN)	TOTAL NO. OF SAMPLES	SAMPLE I.D. NUMBER	RADIATION SCREENING[2]	ORGANIC VAPOR SCREENING (PID/FID)	RAD VAN ANALYSIS[3]	VOCs (SW 8240) (BTEX)	SVOCs (SW 8270)	PCBs (SW 8080)	TPH (SW 8015)
SWMU 3-001(i)											
Random grid 10 x 10 ft	9	0 - 12	9		9	9	9	9		9	9
AOC C-3-016											
Biased samples	4	0 - 12	4		4	4	4	4	4		4
		36 - 48	4		4	4	4	4	4		4
Confirmatory samples	4	TBD	4		4	4	4	4	4		4
SWMU 3-036(b)											
Biased samples	6	0 - 12	6		6	6	6	6	6		6
Confirmatory samples	6	TBD	6		6	6	6	6	6		6
SWMU 3-029(b)											
Trench 1	6	5 - 15 ft	6		6	6	6	6	6		6
Trench 2	6	5 - 15 ft	6		6	6	6	6	6		6
Trench 3	6	5 - 15 ft	6		6	6	6	6	6		6
QC SAMPLES[1]											
Trip Blank	NA	NA	1					1			
Rinsate Blank	NA	NA	2					2	2		2
Field Duplicate	2	TBD	2		2	2	2	2	2	2	2
Field Collocated	2	TBD	2		2	2	2	2	2	2	2
TOTALS	51		58		55	55	55	58	48	13	57

[1]QC samples are determined using guidelines outlined in the site-specific QAPjP, Annex II, Note 2A of Addendum 1. Location is determined by the Field Team Leader.

[2]Gross alpha, beta, and gamma using field instrumentation.

[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.

[4]Represents minimum number of confirmation samples to be submitted for VOCs and radiological constituents based on field screening results. Actual number may vary.

NA = Not applicable.

TBD = To be determined in the field.

only SWMU 3-001(i)

5.24 Underground Storage Tanks West of the CMR Building

5.24.1 Description and History

SWMU 3-034(a) has been identified as building TA-3-154 and the associated underground radioactive liquid waste storage tanks (two stainless steel tanks and two concrete tanks) located partially beneath the building. TA-3-154 was constructed in 1961 to house operating equipment of the four underground storage tanks (USTs) that received radioactive waste from wing 9 of the CMR Building, TA-3-29. SWMU 3-034(a) is located approximately 75 ft west of wing 9 of TA-3-29 (Fig. 5-24-1).

From 1961 to 1983 the USTs received radioactive liquid waste (fission products from the destructive testing of reactor fuel rods) from the hot cell of wing 9 at TA-3-29. The radioactive liquid waste was originally routed to the stainless steel tanks and stored to allow decay of short-lived radionuclides. The radioactive liquid waste was then pumped through a series of stainless steel transfer lines into the concrete storage tanks. Prior to the radioactive liquid waste transfer into the concrete tanks, it was processed through ion exchange columns which resulted in lower activity radioactive liquid waste (LANL 1994, 17-1120).

The two cylindrical stainless steel USTs are located below grade beneath the northern part of TA-3-154 and are accessible from individual manholes outside the building. Each stainless steel tank is 7 ft long and 5 ft in diameter with a maximum capacity of approximately 1 000 gal. and is located inside a concrete vault. In the early 1980s an acid-proof coating was applied to upgrade each concrete vault, which provides secondary containment for each stainless steel tank. The concrete vaults share a common wall and each concrete vault also contains pumps and stainless steel piping associated with the tanks.

Two rectangular concrete USTs are located below grade beneath the southern part of TA-3-154 and are accessible from outside the building via separate manholes. Each concrete tank is approximately 17 ft long x 9 ft wide x 6 ft high, with a maximum capacity of 4 900 gal. The concrete walls of the tanks are 8-in. to 12-in. thick and have an acid-proof coating (also applied in the early 1980s to upgrade the concrete tanks). A single gravity outflow sump pit which served both concrete tanks is located on the south side of the tanks and was used to drain

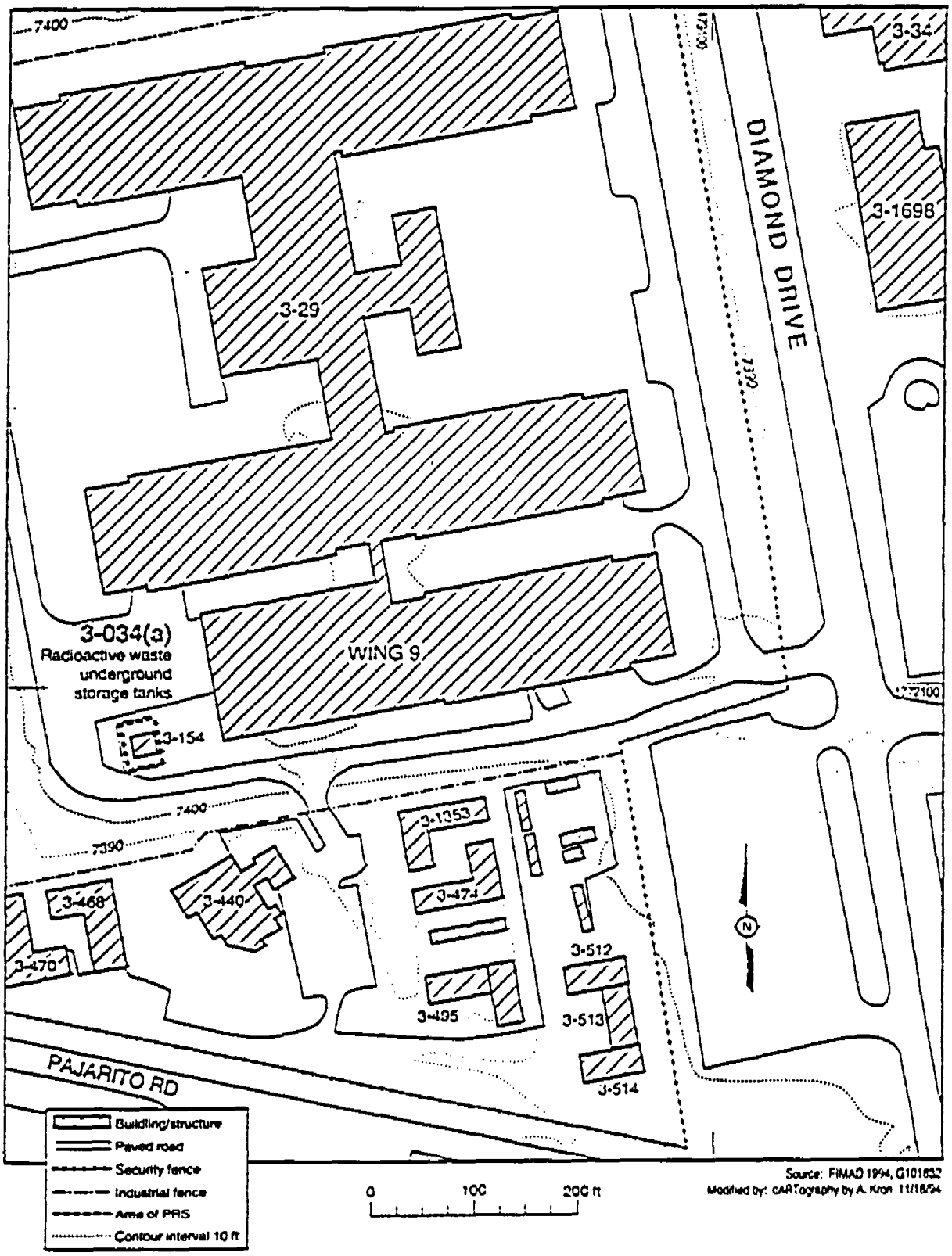


Fig. 5-24-1. Site location map of SWMU 3-034(a).

liquid waste to the industrial waste line. The liquid waste was then pumped to TA-50 (LANL 1994, 17-1117).

After 1983 the stainless steel and concrete USTs were no longer used (LANL 1994, 17-1118). Both sets of tanks were taken off-line in 1985 when the former industrial waste line was removed (LANL 1986, 17-001). The tanks were not reconnected to the new waste line that was installed at that time (LANL 1994, 17-1117).

All four tanks are currently on standby status; it is not known whether they will be reconnected and used in the future. One stainless steel tank and one concrete tank contain radioactive liquid waste (LANL 1994, 17-1120). There were no reported releases from the SWMU 3-034(a) tanks and no unexplained changes in fluid levels that may have indicated leaks (LANL 1994, 17-1120). It is believed that only liquid radioactive waste passed through the SWMU 3-034(a) system; there were no known RCRA waste constituents in the stream (LANL 1994, 17-1120; LANL 1994, 17-1125). The Laboratory's Waste Management Group is planning to sample the liquid waste in the tanks by June 1995 for analyses of a full suite of hazardous constituents and radioisotopes. The results of this analysis may modify the PCOCs identified for this site.

5.24.2 Investigation Approach and Objectives

There is no evidence or documentation that the tanks have leaked in the past; therefore, the nature and extent of any contamination associated with SWMU 3-034(a) is unknown. If radioactive liquid was released from the stainless steel tanks into the surrounding concrete vault, it is likely that the concrete vault would have contained the release and evidence of this release would be present on the interior of the concrete vault in the form of detectable radioactivity. Therefore, the investigation on the stainless steel tanks will focus on a radiological survey of the concrete vault interior. If detectable radioactive contamination is found within the concrete vault, it will be assumed that the concrete vault may not have contained all of the released liquids and a sampling strategy similar to that discussed in the following subsection for the concrete USTs will be followed, including the same list of PCOCs. Until the results from the Laboratory's Waste Management Group are available, PCOCs are radionuclides, including isotopic plutonium, isotopic uranium, and isotopic cesium.

Any release from the concrete USTs would also consist of radionuclide contamination. No known RCRA waste constituents were in the liquid waste stream that entered the tanks; however, metals may have been present as part of other activities in TA-3-29. As discussed previously, a full suite of hazardous constituent analyses will be conducted on the liquid waste by the Laboratory's Waste Management Group. These analytical results will assist in refining the list of PCOCs.

Biased sampling will be conducted by hollow stem augering and sampling within the soil surrounding the concrete tanks at the depth where contamination is most likely to exist. When the tanks were filled to capacity, the tops of the tanks would represent the minimum depth at which contamination would be detected. From this depth, contamination would move laterally and vertically as a result of gravity and preferential flow paths. Spatial distribution of contamination is a function of PCOCs and the physical and chemical characteristics of the surrounding media. This biased approach is based on the known history of the SWMUs and the PCOC migration potential factors discussed in Subsection 5.0.5 of Addendum 1.

5.24.3 Sample Locations and Methods

A total of four biased sample locations were selected for sampling at this PRS. Results of the radiological survey to be conducted in the concrete vaults may result in four additional sample locations. The sampling locations which will be used to identify the presence and nature of PCOCs are presented in Fig. 5-24-2. Description of sample locations in this subsection use a five-foot distance from the exterior of all tank walls. In the field the boreholes will be placed as close to the tanks as possible but no further away than five feet. If contamination is detected, additional boreholes may be drilled to try to further determine the lateral extent of contamination. One biased sampling site will be located along each of the exterior east and west walls of the concrete USTs. Two of these sample sites are located approximately six feet south of TA-3-154 and five feet out from the walls of the concrete USTs. The two remaining samples will be collected from approximately five feet south of the southern wall of the USTs. The north side of the tanks is actually located under TA-3-154 and, therefore, will not be sampled (Fig. 5-24-2).

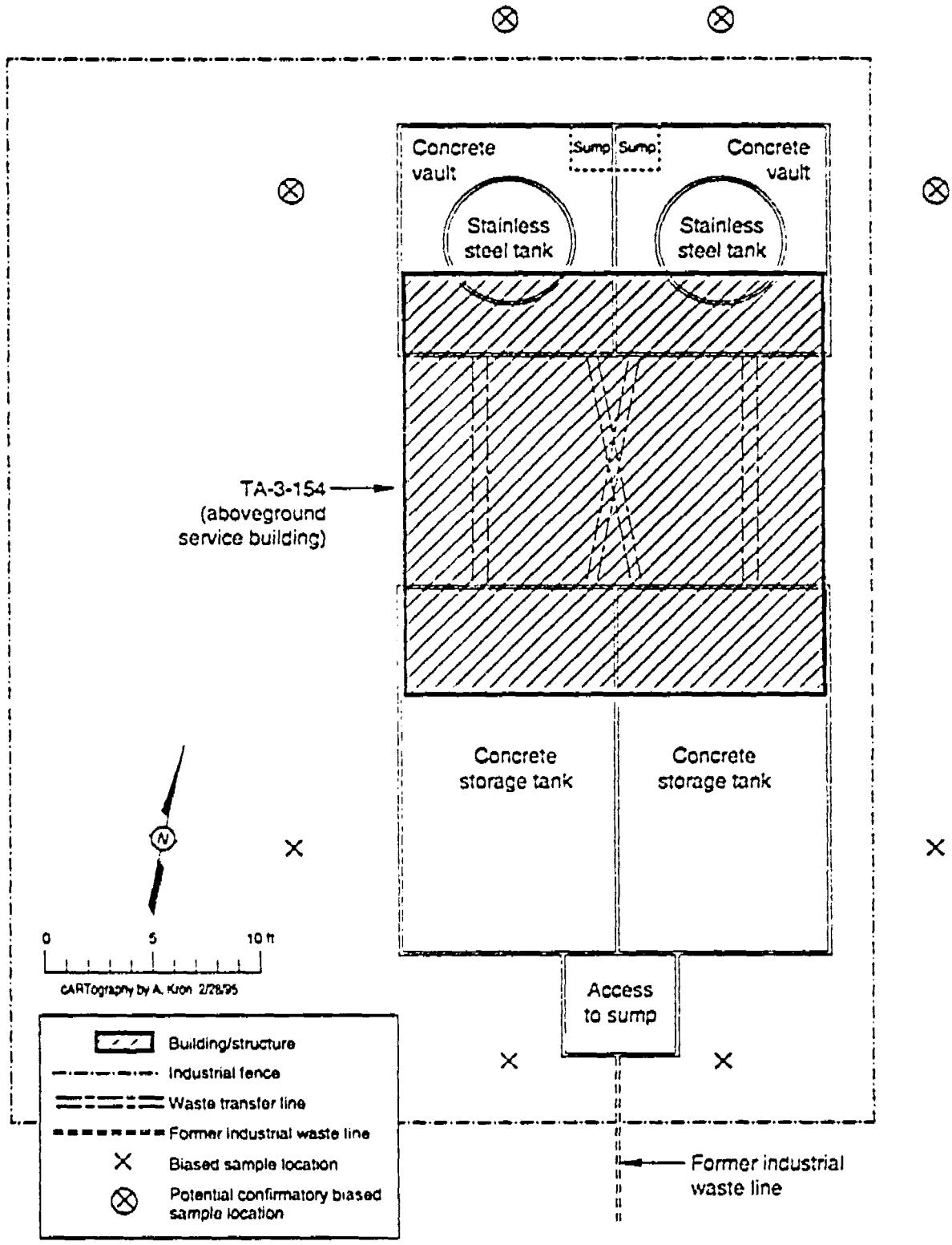


Fig. 5-24-2. Location of sample sites for SWMU 3-034(a).

Samples will not be collected from soil surrounding the concrete vaults that contain the stainless steel tanks unless the radiological survey conducted in either concrete vault with a hand-held gross gamma survey instrument indicates that a release occurred. If a release is indicated, the structural integrity of the concrete vaults will be investigated to determine if material may have escaped the vaults. If such a release is indicated, sampling activities will be expanded to include these concrete vaults. In that event, one biased sample site will be located along each of the exterior east and west walls of the concrete vaults. These sample sites are located approximately five feet from the respective walls of the concrete vaults and three feet south along the walls of each concrete vault. Two additional samples will be collected along the northern wall. Again, the fourth wall is inaccessible and, therefore, will not be sampled (Fig. 5-24-2) (LASL 1962, ENG-C-31111).

All subsurface materials (soil and tuff) within each core barrel will be continuously screened with a PID/FID for VOCs in 2.5-ft intervals from the top of the tank to approximately 2-ft below the base of the tank or to the fill/tuff interface. If VOC field screening of samples indicates a concentration greater than background readings, VOC sampling will commence with subsequent core barrels (brass sleeves will be used within core barrels). Samples will be collected from the portion of the core barrel with the highest VOC reading and submitted for laboratory analysis. If VOC field screening does not indicate the presence of volatile constituents within each borehole, a VOC sample will be collected from the final core barrel to confirm field screening results.

In addition, all soil samples will be field screened for radiological constituents using a hand-held gross gamma survey instrument. Field screening will be performed from 8 ft (the approximate top of the concrete USTs) to 16 ft (approximately two ft below the bottom of the concrete USTs or the fill/tuff interface) (LASL 1962, ENG-C-31111). If the radioactivity field screening results are three standard deviations or more above background, samples will be collected from the section of the core barrel with the highest radioactivity reading and submitted to a fixed laboratory for isotopic plutonium, isotopic uranium, gamma spectroscopy for isotopic cesium, and strontium-90 analyses. If radioactivity is not detected as described above, within each borehole, a sample will be collected from the final core barrel, (preferably below the bottom of the tanks at the fill-tuff interface) and submitted to a fixed laboratory for confirmatory

analysis of isotopic plutonium, isotopic uranium, gamma spectroscopy for isotopic cesium, and strontium-90 to validate field-screening data.

Three 12-in. soil sample intervals will be collected at each sample location and submitted for laboratory analysis. The first sample will be collected from soil depth corresponding with the top of the concrete USTs (eight to nine-foot depth). The second sample location will be from above the bottom of the tanks (13 to 14-ft depth), and the third sample location will be from below the bottom of the tanks (15 to 16-ft depth). From each of these depth intervals the sample will be collected and homogenized prior to submittal for analysis of those hazardous constituents identified by the Laboratory's Waste Management Group. If sampling is required, similar depth intervals would be used for the stainless steel tanks inside the concrete vaults.

Before drilling and sampling begins, a review of engineering and utilities drawings will be performed to locate all underground structures; this review may slightly modify these specific borehole locations. Hollow-stem drilling and sampling techniques will follow the procedures outlined in LANL-ER-SOP-04.01, R0, Drilling Methods and Drill Site Management and LANL-ER-SOP-06.26, R0, Core Barrel Sampling for Subsurface Earth Materials. All cores will be visually inspected and logged according to LANL-ER-SOP-04.04, R0, General Borehole Logging.

5.~~24~~21.4 Laboratory Analyses

Soil and tuff samples listed above may be analyzed in the mobile radiation detection van to guide drilling activities, with confirmatory samples listed in Table 5-24-1 analyzed in a fixed laboratory using appropriate EPA methodology. The number of anticipated samples, their locations, and the types of analyses are summarized in Table 5-24-1. Assuming that the soil surrounding the concrete vault will not be sampled, the maximum number of samples anticipated include four sample sites at the top of the concrete USTs, four sample sites above the bottom of the tanks, and four sample sites below the bottom of the tanks. One rinsate blank and one field duplicate will be submitted for analyses as a maximum number of QC samples determined by using the guidelines in the site-specific QAPjP, Annex II, Note 2A of Addendum 1. All samples will be prepared and shipped in accordance with LANL ER standard operating procedures for chain-of-custody and transportation as listed in Appendix D of Addendum 1.

TABLE 5-24-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE 1 SAMPLING PLAN SUMMARY OF SWMU 3-034(a) RADIOACTIVE LIQUID WASTE UNDERGROUND STORAGE TANKS

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LABORATORY ANALYSIS			FIELD LAB
								RADIO-NUC-LIDES	ORGANICS		RAD
SAMPLING LOCATION DESCRIPTION	NO. OF SAMPLE LOCATIONS	SAMPLE DEPTH (FT.)	TOTAL NO. OF SAMPLES	SAMPLE I.D. NUMBER	RADIATION SCREENING[2]	ORGANIC VAPOR SCREENING (PID/FID)	RAD VAN ANALYSIS[3]	ISOTOPIC-PLUTONIUM, ISOTOPIC-URANIUM GAMMA SPEC, SR-90	VOCs	LANL PARAMETERS[5]	GROSS ALPHA/BETA GAMMA SPEC
Concrete USTs											
Top of concrete USTs	4	8 - 9	4		4	4	4			4	4[6]
Above bottom of USTs	4	13 - 14	4		4	4	4			4	4[6]
Below bottom of USTs	4	15 - 16	4		4	4	4			4	4[6]
QC SAMPLES[1]											
FIELD DUPLICATE	1	TBD	1		1	1	1	1		1	
RINSATE BLANK	NA	NA	1								
Confirmatory samples	4	TBD	4		4	4	4	4[4]	4[4]		
TOTALS	17		18		17	17	17	5	4	13	12

[1]QC samples are determined using guidelines outlined in the site specific QAPJP, Annex II, not 2A of this workplan. Location determined by the Field Team Leader.

[2]Gross alpha, beta, and gamma using field instrumentation.

[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.

[4]Represents minimum number of confirmatory samples to be submitted for VOCs and radiological constituents based on field screening results. Actual number may vary.

[5]The laboratory's Waste Management Group will identify hazardous constituents to be tested prior to initiating field activities.

[6]Potential number of samples collected to guide additional drilling activies (number may vary).

NA = Not applicable.

22 SWMU 3-007

5.25 Decommissioned Firing Site

5.25.1 Description and History

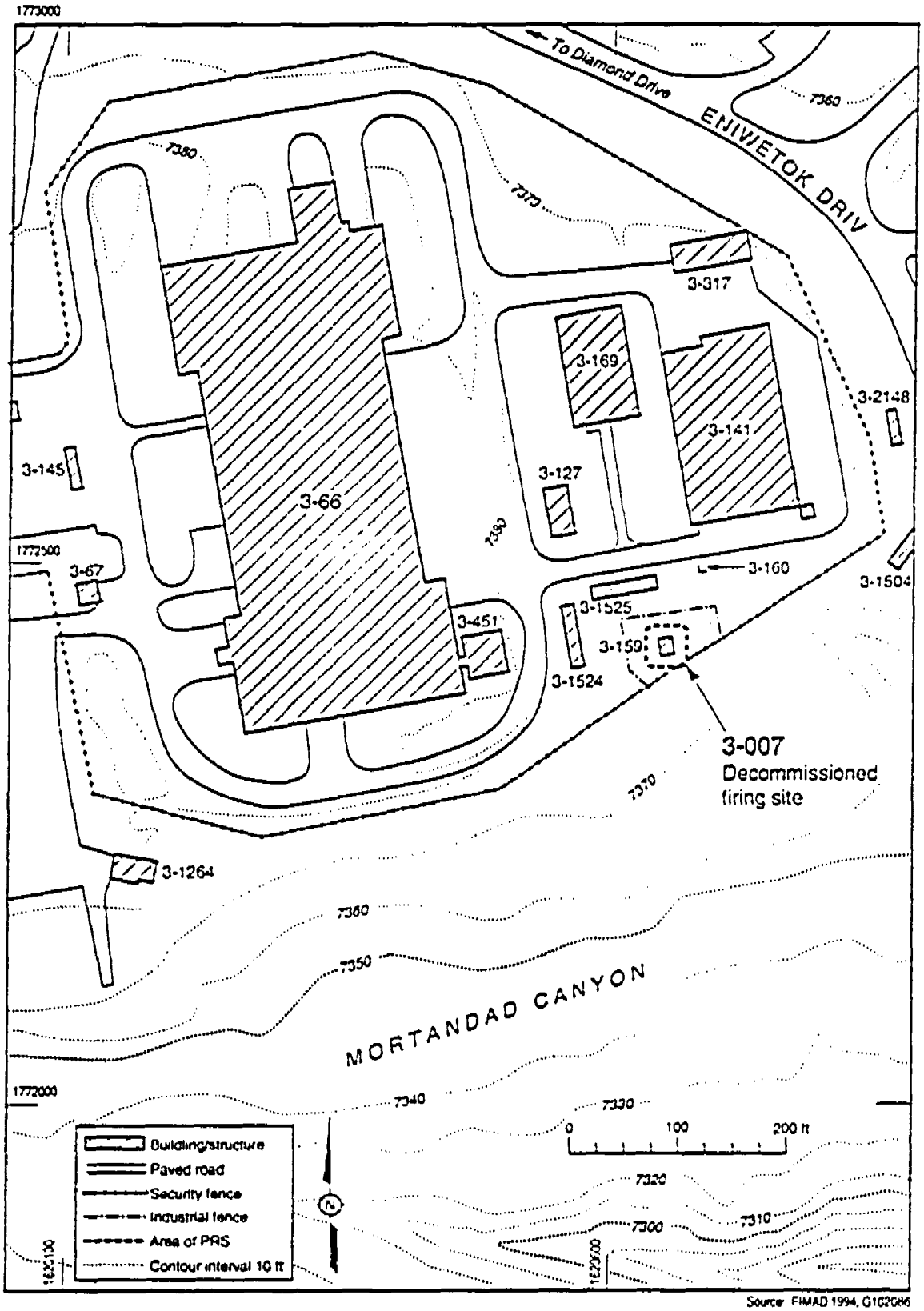
SWMU 3-007 is a decommissioned firing site, located southwest of TA-3-141 (Rolling Mill Building), and includes structures TA-3-159, a containment building for explosive experiments and TA-3-160, a personnel safety barrier (Fig. 5-25-1). Both structures were constructed using prefabricated concrete slabs. TA-3-159 is situated on an 8-ft-square slab and has 6-in.-thick by 8-ft-high walls and an opening on one side serving as an entrance. TA-3-160 is situated on a slab and has two 8-ft-high by 4-ft-wide by 6-in.-thick walls that are set at a 90-degree angle (LANL 1993, 17-947).

From 1970 to 1975, approximately 50 to 75 explosive shot experiments were detonated within TA-3-159 to bond or form metals (copper, silver, iron, etc.). During the experiments, the energy of the detonation forced the metal into a concrete mold. Plastic blasting caps were used to initiate/detonate explosive shots consisting of approximately two pounds of high explosive (HE) mixtures such as Composition C (TNT and RDX) or Torpex (TNT, aluminum, and RDX). After an explosive shot, TA-3-159 was often rinsed with water that was allowed to drain outside the building through a gap between the floor and wall.

The firing site was cleaned up in the late 1970s with no HE contamination detected in the area. No formal documentation of past usage, cleanup criteria, or modifications to TA-3-160 or TA-3-159 has been found (LANL 1993, 17-947). By 1983 TA-3-159 was no longer used as the containment building for explosive experiments and was modified to serve as a storage building; a fiberglass roof and a doorway were installed. From the late 1980s to the present, TA-3-159 has been used to store thoria (oxide) and thorium (metal) (LANL 1993, 17-947).

5.25.2 Investigation Approach and Objectives

Since washdown practices may have resulted in contamination of adjacent soil, investigation activities for this SWMU will focus on detecting the presence and nature of potential contamination in the soils surrounding the containment building, TA-3-159. PCOCs for this site include thorium, Appendix VIII metals, and HE. Because SVOCs are formed from the breakdown of HE, they are also considered PCOCs for this site.



Source: FIMAD 1994, G102086
Modified by: cARTography by A. Kron 2/28/95

Fig. 5-25-1. Site location map of SWMU 3-007.

Biased sampling will be conducted from the soil along the north and east walls of structure TA-3-159, targeting areas most likely to have been contaminated by wash water exiting the structure through the gap between the floor and the walls. Sampling locations are based on the known history of the SWMU and the soil and PCOC migration potential as described in Subsection 5.0.3 of Addendum 1.

The number of samples and locations were selected based on the size of the building and the likely area where wash water would have ponded and drained. Based on the factors listed above, the PCOCs identified for this site are most likely to have accumulated in surface soil. Therefore, biased samples will target the surface soil interval.

5.25.3 Sample Locations and Methods

A total of six sample locations were selected along the north and east sides of TA-3-159 as identified in Figure 5-25-2. These sites were selected to identify the presence and nature of PCOCs based on site-specific factors listed in Subsection 5.25.2. Along the length of both the north and east walls, one biased soil sample will be collected at the center and one approximately two feet on either side of center, with all samples collected at a distance of one foot from the wall.

Before field sampling begins, ESH-1 will be contacted to conduct a radiation survey around structure TA-3-159 to determine if any time limitations must be set for fieldwork based on the potential radiation dose from the storage of thorium. Fieldwork will be tailored to time constraints established by this survey. In addition, all samples will be field screened and collected for VOCs and field screened for radiological constituents as described in Subsection 5.0.5 of Addendum 1.

As previously noted, PCOCs would most likely accumulate in the surface soil interval. Therefore, soil samples will be collected at the 0 to 12-in. depth. Prior to homogenization of the collected sample, an aliquot of soil will be collected for laboratory analysis of SVOCs. The remainder of the collected sample will be homogenized prior to submittal for analysis of isotopic thorium, HE, and Appendix VIII metals.

The soil samples will be collected at the 0 to 12-in. depth using LANL-ER-SOP-06.09, R0, the Spade and Scoop Method for Collection of Soil

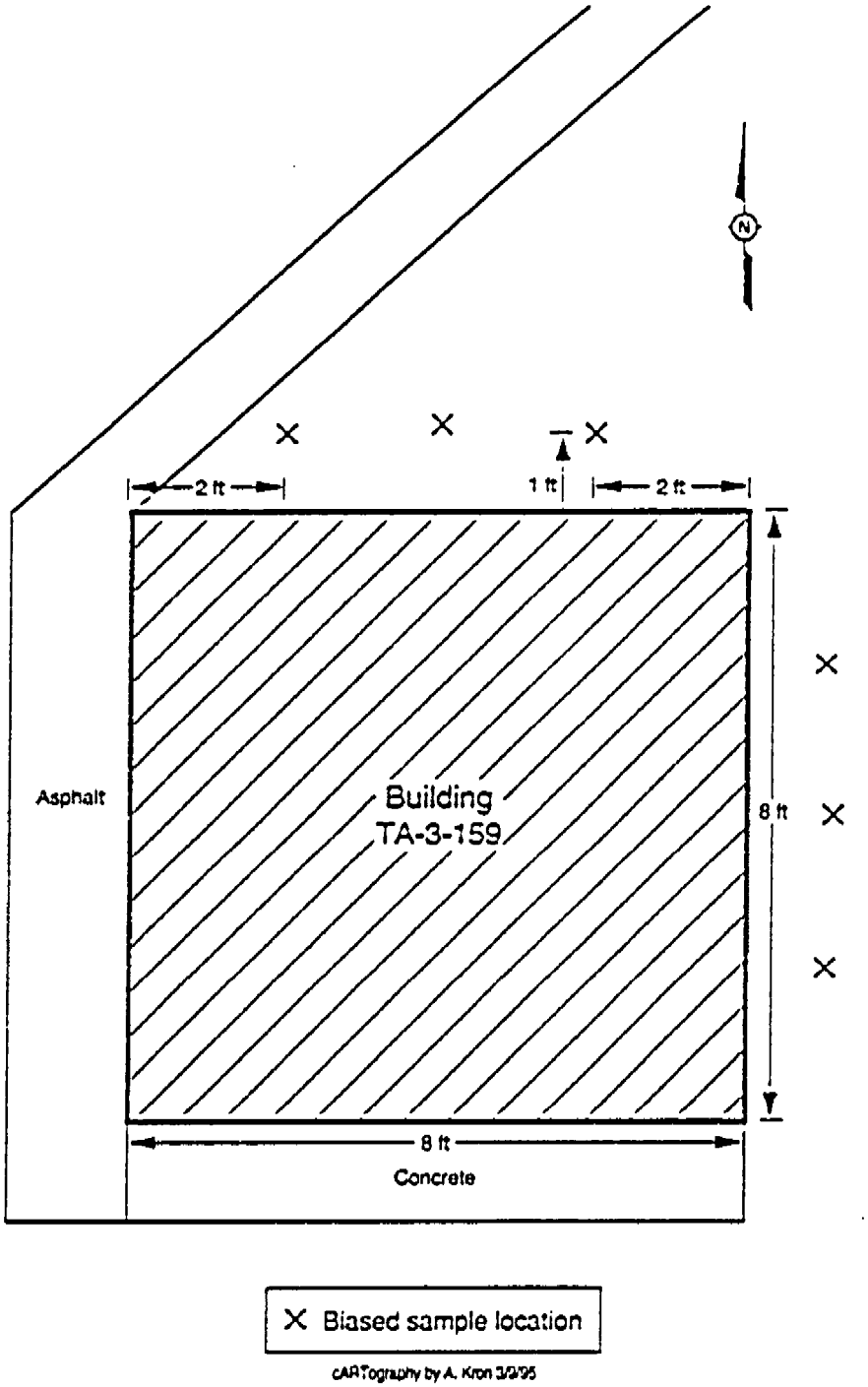


Fig. 5-25-2. Location of sample sites for SWMU 3-007.

Samples or LANL-ER-SOP-06.10, R0, Hand Auger and Thin-Wall Tube Sampler. A split-tube fitted with a brass sleeve will be used during sample collection to facilitate sample removal. Specific sample collection procedures that must be followed are discussed in Appendix D of Addendum 1.

5.25.4 Laboratory Analyses

Soil samples will be analyzed for isotopic thorium, Appendix VIII metals, HE, SVOCs, and VOCs using appropriate EPA methodology. The number of anticipated samples, their locations, and the types of analyses are summarized in Table 5-25-1. One field collocated sample will be submitted for analysis as the maximum number of QC samples determined by using the guidelines in the site-specific QAPjP, Annex II, Note 2A of Addendum 1. All samples will be prepared and shipped in accordance with LANL ER standard operating procedures for chain-of-custody and transportation as listed in Appendix D of Addendum 1.

TABLE 5-25-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE 1 SAMPLING PLAN SUMMARY OF SWMU 3-007 DECOMMISSIONED FIRING SITE

SAMPLE DESCRIPTION					FIELD SCREENING			FIXED LABORATORY ANALYSIS				
								RADIO-NUC-LIDES	ORGANICS		METALS	MISC
SAMPLING LOCATION DESCRIPTION	NO. OF SAMPLE LOCATIONS	SAMPLE DEPTH (IN.)	TOTAL NO. OF SAMPLES	SAMPLE I.D. NUMBER	RADIATION SCREENING[2]	ORGANIC VAPOR SCREENING (PID/FID)	RAD VAN ANALYSIS[3]	ISOTOPIC THORIUM	VOCs (SW 8240)	SVOCs (SW 8270)	APPENDIX VIII METALS (SW 6010, 7000)	HIGH EXPLOSIVES (USATHAMA)
Biased sampling												
Outside of exterior walls	6	0 - 12	6		6	6	6	6		6	6	6
on the north and east sides												
QC SAMPLES[1]												
Field Collocated	1	TBD	1		1	1	1	1		1	1	1
Confirmatory samples	2	6 - 12	4		2	2	2		2[4]			
TOTALS	9		11		9	9	9	7	2	7	7	7

[1]QC samples are determined using guidelines outlined in the site-specific QAPjP, Annex II, Note 2A of Addendum 1. Location is determined by the Field Team Leader.

[2]Gross alpha, beta, and gamma using field instrumentation.

[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.

[4]Represents minimum number of confirmatory samples to be submitted for VOCs based on field screening results. Actual number may vary.
TBD = To be determined in field.

5.~~26~~ 23 Dumpsters West of the CMR Building

5.~~26~~ 23.1 Description and History

The PRSs included in this aggregate are SWMU 3-004(c) and SWMU 3-004(d). These SWMUs can be sampled together because they share similar PCOCs and physical settings; therefore, the sampling strategy at both SWMUs is similar. SWMU 3-004(c) is a dumpster area located at the main loading dock of TA-3-29, the CMR Building. SWMU 3-004(d) is a former dumpster area located west of wing 9, TA-3-29 (Fig. 5-26-1).

SWMU 3-004(c) is a level, asphalted area approximately 85 ft long x 50 ft wide, occupied by two dumpsters; this loading dock area has been an active site since TA-3-29 opened in 1952. Both dumpsters receive boxed waste measured by the Multiple Energy Gamma Assay System (MEGAS). MEGAS has an assay range from 0 to 100 nCi/g; waste within this range is referred to as low-level waste (LLW). Only boxed waste assayed between 0 to 99 nCi/g, a dose rate below 0.5 mR/hr per box, and weighing no more than 15 kilograms is allowed into these dumpsters. A majority of the waste is below 50 nCi/g; 90% of the boxes are below 10 nCi/g. Boxes of waste assayed at or above 100 nCi/g, transuranic (TRU), and/or exceeding the 15 kilogram weight limit are returned to the originator for sorting and repackaging. One dumpster receives compactable waste and the other receives non-compactable waste. These dumpsters typically receive waste from offices within all wings of TA-3-29 (wing 9 waste is also accepted if it meets the above criteria) and waste from radioactive material handling areas. The waste material consists of gloves, paper products, glass, plastic, and metal. Runoff from this dumpster area drains to a storm drain inlet grate located approximately 50 ft southwest of SWMU 3-004(c). The storm drain eventually discharges at an outfall in upper Mortandad Canyon (Fig. 5-26-1). This outfall site, designated NPDES permit number EPA 03A021, is also identified as SWMU 3-054(e), addressed by a sampling plan in Subsection 5.12 of this workplan.

SWMU 3-004(d) is a level, gravel-covered area, approximately 75 ft long by 20 ft wide, that is located south of the steps at the west end of wing 9 of TA-3-29. One dumpster formerly occupied this area, but it is now housed within wing 9. This dumpster has always been considered part of a contaminated facility used to accumulate contact-handled waste from the operations of wing 9 hot cells. When

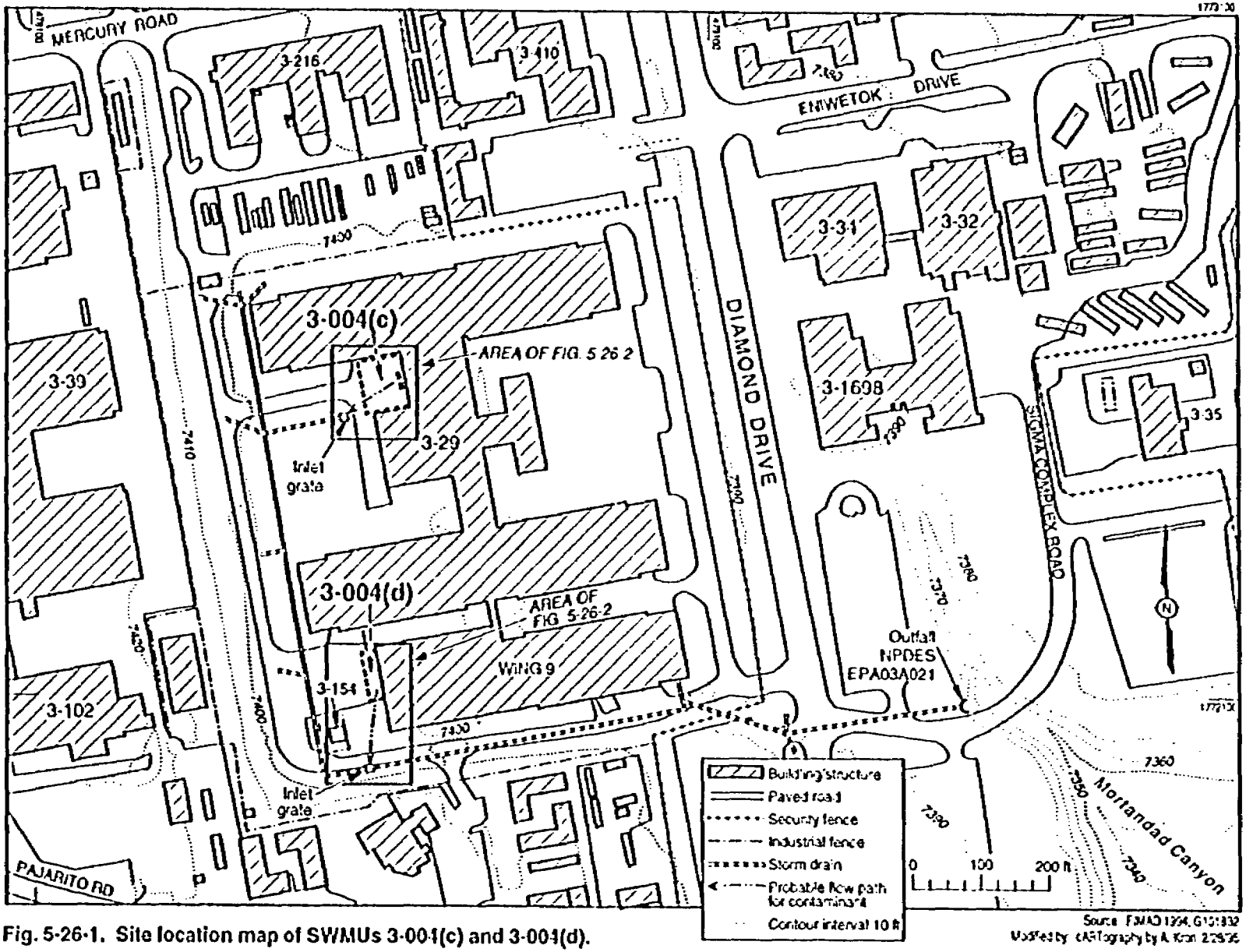


Fig. 5-26-1. Site location map of SWMUs 3-004(c) and 3-004(d).

Source: FMAD 1994, G151832
Modified by cartography by A. Kron 2/28/95

the dumpster was located at SWMU 3-004(d), it typically received waste that consisted of rags, small hardware, paper, machine shop waste, and cleaning materials, with an occasional docontaminated hot cell item. All waste was bagged and boxed prior to being placed into the dumpster. Runoff from this area flows to a storm drain inlet grate located approximately 100 ft west of SWMU 3-004(d). The storm drain eventually discharges into upper Mortandad Canyon at outfall location SWMU 3-054(e) (Figs. 5-26-1 and 5-26-2).

5.26.2 Investigation Approach and Objectives

Investigation activities for this SWMU aggregate will focus on detecting the presence and nature of potential contamination in the asphalt and underlying soil surrounding SWMU 3-004(c) and in soil underlying gravel at SWMU 3-004(d). Liquids may have occasionally been part of the waste stream disposed in dumpsters at these SWMUs, and rainwater may have entered the dumpsters. Liquids draining from the dumpsters may have carried contaminants from waste material in the dumpsters outside to the surrounding area. The primary PCOCs for SWMU 3-004(c) and SWMU 3-004(d) are radionuclides, specifically plutonium, uranium, and cesium. However, other PCOCs which may have been part of waste materials, including SVOCs and Appendix VIII metals, may also have been carried outside the dumpsters.

Biased sampling methods will be used to investigate SWMU 3-004(c) and SWMU 3-004(d). Biased sampling will target the areas most likely to have been contaminated by liquid drainage from the dumpsters, if such an event occurred. The biased approach is based on the known history of the SWMUs and the soil and PCOC migration potential described in Subsection 5.0.3 of Addendum 1.

5.26.3 Sample Locations and Methods

Biased sampling within the dumpster areas will be conducted in soil and asphalt at SWMU 3-004(c) and in soil at SWMU 3-004(d). Samples will be collected from nine locations at SWMU 3-004(c) and from ten locations at SWMU 3-004(d). Asphalt samples for SWMU 3-004(c) will first be removed from each sample location using LANL-ER-SOP-06.28, R0, Chip Sampling of Porous Surfaces, and then collected for isotopic plutonium, isotopic uranium and gamma spectroscopy for cesium analyses. Prior to surface soil sample collection at each PRS where gravel is present, gravel underlying the asphalt will be removed from the sample

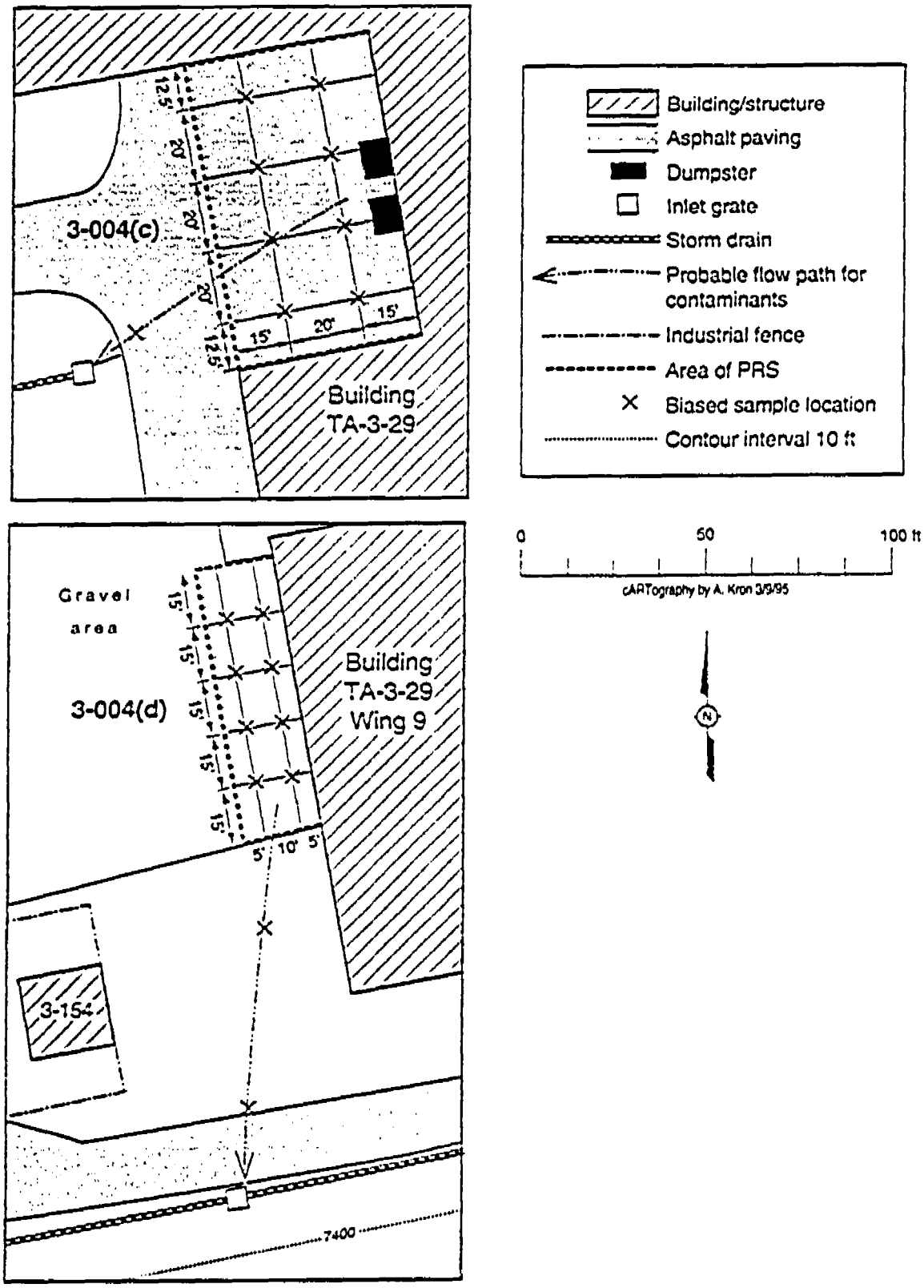


Fig. 5-26-2. Location of sample sites for SWMUs 3-004(c) and 3-004(d).

locations using a stainless steel shovel. It is likely that the dumpster locations varied within each area as a result of being lifted and emptied and replaced for waste disposal. In order to include these slight location variations, four transects will be established perpendicular to the long axis of SWMU 3-004(c). These transects will be located approximately 20 ft apart with samples collected every 20 ft along each transect. An additional sample site will be located approximately midpoint between SWMU 3-004(c) and the storm drain that collects area runoff. The midpoint is approximately 25 ft downgradient of SWMU 3-004(c); the specific location will be determined based on field observations. For SWMU 3-004(d), 4 transects will be established perpendicular to the long axis, approximately 15 ft apart with samples collected every 10 ft along each transect. At SWMU 3-004(d), 2 additional sample sites will be located approximately 25 ft and 75 ft from the southern boundary of SWMU 3-004(d) in a transect toward the storm drain that collects area runoff. Specific sampling locations will be determined based on field observations. Sampling sites for both SWMUs are shown in Fig. 5-26-2.

All soil samples will be field screened for VOCs as described in Subsection 5.0.5 of Addendum 1. All soil and asphalt samples will also be field screened for radiological constituents as described in Subsection 5.0.5 of Addendum 1. These samples will be sent to a fixed laboratory for confirmatory analyses of isotopic plutonium, isotopic uranium, and gamma spectroscopy for cesium to validate field-screening data.

Soil samples at each PRS will be collected from the 0 to 12-in. depth interval. An aliquot of soil will be collected from each sample interval prior to homogenization and submitted for laboratory analysis of SVOCs. The remainder of each sample interval will be homogenized and then submitted for laboratory analysis of Appendix VIII metals.

Soil samples will also be collected from the 12-in. interval immediately above the clay-rich horizon or the soil-tuff interface if no clay-rich horizon is found. An aliquot of soil will be collected from the sample intervals prior to homogenization and submitted for laboratory analysis of SVOCs. The remainder of each sample interval will be homogenized and then submitted for laboratory analysis of Appendix VIII metals.

Soil samples from the accessible surface soil and from soil immediately beneath the asphalt and base course will be collected using LANL-ER-SOP-06.09, R0,

the Spade and Scoop Method for Collection of Soil Samples. Samples collected at depth and all adjacent VOC soil samples will be collected using LANL-ER-SOP-06.10, R0, the Hand Auger and Thin-Wall Tube Sampler method. A split tube will be used to facilitate soil sample removal. Adjacent samples for VOC analysis will be collected using a hand auger fitted with a brass sleeve. Specific sample collection procedures that must be followed are discussed in Appendix D of Addendum 1.

5.~~26~~23.4 Laboratory Analyses

Asphalt and soil samples will be analyzed in the laboratory for the constituents described above using appropriate EPA methodology. The number of anticipated samples, their locations, and the types of analyses are summarized in Table 5-26-1. One rinsate blank, one field duplicate, and one collocated sample will be submitted for analyses as a maximum number of QC samples determined by using the guidelines in the site-specific QAPjP, Annex II, Note 2A of Addendum 1. All samples will be prepared and shipped in accordance with LANL ER standard operating procedures for chain-of-custody and transportation as listed in Appendix D of Addendum 1.

TABLE 6-26-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE 1 SAMPLING PLAN SUMMARY OF SWMU 3-004(c,d) DUMPSTER AREAS BEHIND THE CMR BUILDING

SAMPLE DESCRIPTION					FIELD SCREEN		FIELD LAB	FIXED LABORATORY ANALYSIS			
								RADIO-NUCLIDES	ORGANICS		METALS
SAMPLING LOCATION DESCRIPTION	NO. OF SAMPLE LOCATIONS	SAMPLE DEPTH (IN)	TOTAL NO. OF SAMPLES	SAMPLE I.D. NUMBER	RADIATION SCREENING[2]	ORGANIC VAPOR SCREENING (PID/FID)	RAD VAN ANALYSIS[3]	ISOTOPIC PLUTONIUM, ISOTOPIC URANIUM, GAMMA SPECTROSCOPY	VOCs (SW 8240)	SVOCs (SW 8270)	APPENDIX VIII METALS (SW 6010, 7000)
SWMU 3-004(c)											
Dumpster area transects	8	Asphalt	8		8	8	8	8[6]			
		0 - 12	8		8	8	8			8	8
		s/t[5]	8		8	8	8			8	8
Drainage area	1	Asphalt	1		1	1	1	1[6]			
		0 - 12	1		1	1	1			1	1
		s/t	1		1	1	1			1	1
SWMU 3-004(d)											
Dumpster area transects	8	0 - 12	8		8	8	8			8	8
		s/t	8		8	8	8			8	8
Drainage area	2	0 - 12	2		2	2	2			2	2
		s/t	2		2	2	2			2	2
QC SAMPLES[1]											
Field Duplicate	1	TBD	1		1	1	1			1	1
Field Collocated	1	TBD	1		1	1	1			1	1
Rinsate Blank	NA	NA	1							1	1
Confirmatory samples	4	TBD	4		4	4	4	2[4]	2[4]		
TOTALS	25		54		53	53	53	11	2	41	41

[1]QC samples are determined using guidelines outlined in the site specific QAPJP, Annex II, note 2A of this workplan. Location determined by Field Team Leader.

[2]Gross alpha, beta, and gamma using field instrumentation.

[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.

[4]Represents minimum number of confirmation samples to be submitted for VOCs and radiological constituents based on field screening results. Actual number may vary.

[5]s/t = soil/tuff interface (12-in. interval above interface).

[6]Asphalt samples will be analyzed for gross alpha/beta and gamma spectroscopy, and the listed isotopes if results deem necessary.

NA = Not applicable.

TBD = To be determined in the field.

C-3-053

5.27 Basement of the Rolling Mill Building, TA-3-141

5.27.1 Description and History

Area of concern C-3-053 is designated as the basement area of the Rolling Mill Building, TA-3-141. From 1962 to 1990, TA-3-141 housed electrochemical and depleted uranium processing facilities (Keenan 1977, 17-199). Currently, powder characterization, plasma flame spray processing, beryllium processing, and depleted uranium processing are ongoing operations. The solid waste generated at TA-3-141 is classified as low-level radioactive waste. The Weston Task Report (LANL 1989, 17-017) states that materials used in TA-3-141 included uranium-238, uranium-235, thorium-232, lead, nickel, tungsten, cadmium, antimony, bismuth, copper, zirconium, barium, and infrequently tritium. TA-3-141 is listed as a "contaminated facility currently in use" (i.e., a controlled facility) due to ongoing uranium usage, and is also listed as a moderate hazard category due to work with uranium metallurgy (LASL 1975, 17-190). It is unknown if releases occurred through the basement floor drains that were formerly connected to the storm water system.

A number of drains at TA-3-141 were previously routed to an outfall (SWMU 3-015) located approximately 10 ft outside of TA-3-141 and east of the Sigma Complex security fence. Discharge from the outfall flowed into the ditch adjacent to Eniwetok Drive. This drainage originated from the beryllium facility, the mezzanine floor drains, and all of the building roof drains. During heavy rains water would back up through the floor drains located in some work areas. Water draining from the work area floors could potentially carry loose material to the floor drains and eventually to the outfall. No contamination was detected during occasional radiological surveys of the outfall area while there was high usage of powdered, depleted uranium compounds.

The floor drains have been rerouted into the TA-50 radioactive liquid waste line, and in 1992 the roof drains were rerouted to an existing outfall in Mortandad Canyon. The lines draining to the outfall were decommissioned in February 1993. During decommissioning, one water sample was collected from the outfall area and analyzed for radioactivity. Alpha (plutonium and uranium) and beta radiation analyses resulted in less than detectable counts (less than 14 counts per minute) (LANL 1993, 17-811).

24

5.~~27~~.2 Investigation Summary

C-3-053 was evaluated during the summer 1994 investigation of SWMU 3-015. C-3-053 corresponds to the basement floor drains TA-3-141 that previously discharged to the outfall designated as SWMU 3-015. The sampling and analysis plan presented in Subsection 5.3 of the July 1993 RFI Work Plan for OU 1114 describes the investigation rationale, sampling approach, and laboratory analyses for C-3-053 and SWMU 3-015 (LANL 1993, 1090). The investigation involved characterization of the outfall (SWMU 3-015) through the collection and analysis of five surface soil samples for Appendix VIII metals, SVOCs, PCBs, radionuclides, and VOCs. These samples were collected from the 0 to 12-in. interval in the drainage channel associated with the outfall. Data from these samples will be used to characterize C-3-053, and results will be documented in future RFI reports for OU 1114.

25 SWMU 3-052(f):

5.28 Outfall Northeast of TA-3-207

5.28.1 Description and History

SWMU 3-052(f) is an outfall located northeast of building TA-3-207 that discharges to Sandia Canyon. This outfall received flow from floor drains, sumps, sinks, and water fountains associated with several buildings at TA-3, as well as effluent from three reported spills within TA-3. Information from the Sherwood Building (TA-3-105) indicates that dielectric insulating oil, hydraulic oil, and possibly other PCB-containing oil may have been discharged to the storm drain. The drains in TA-3-105 were rerouted to the sanitary sewer system in 1991 (ENG C-20763). The floor drains [SWMUs 3-013 (a,b)], sinks, and water fountains from the Johnson Controls shop building (TA-3-38) drained to this outfall until 1987 when the drains were rerouted to the TA-3 sanitary sewer system (Alexander 1987, 17-763). During 1968, Stoddard® solvent (xylene - petroleum naphtha product) from the maintenance shop and dry acid and caustic materials from the pipefitter operations were discarded through sinks and floor drains (Schultz 1968, 17-145). In addition, floor drains, sinks, and water fountains of the Nevada Test Site (NTS) shop TA-3-38 originally discharged wastewater directly to the storm drain system. During the 1960s and 1970s, spent paint solvents and cutting oils contaminated with machined beryllium particles may have been released to the floor drains (LANL 1990, 0145). In addition, cooling water for welding torches was also discharged directly to the storm drain (Alexander 1987, 17-763). Wastewater discharging into the storm drain may also have contained lead, chromium, nickel, and other metals.

Three reported spills may have also affected SWMU 3-052(f); two occurred in building TA-3-287 and one in a utility trench excavated between buildings TA-3-1793 and TA-3-1794. The first spill consisted of approximately 200 gal. of a water/waste oil mixture that was discharged following the failure of an automatic compressor blow-down mechanism (Barnett 1989, 17-952). The second spill consisted of a ruptured air compressor oil line in the basement of TA-3-287 resulting in an approximately one quart spill of compressor oil into the floor drain (Talley 1989, 17-951). This spill resulted in an oily sheen on the surface of the water at the outfall. The third spill consisted of approximately 15 gal. of diesel fuel that was released from a ruptured truck fuel line into the utilities construction

trench between buildings TA-3-1793 and TA-3-1794. On the same day, a clay sewer pipe in the utility trench broke, releasing approximately 2 000 gal. of wastewater into the excavation (LANL 1989, 17-950). A sump pump was used to remove the wastewater from the excavation and discharge it to the SWMU 3-013(a) storm drain. The diesel-contaminated asphalt and soil was removed and disposed at Sigma Mesa for land farming (LANL 1989, 17-950). The possibility exists that some diesel fuel may have been mixed with the wastewater and may have been discharged at SWMU 3-052(f).

The outfall is categorized by the NPDES permit as industrial and receives waters from noncontact cooling water, non-destructive testing discharge, and production facilities. All industrial outfalls throughout the Laboratory are sampled weekly on a sequential, rotating basis. The sample monitoring parameters include flow rate, total suspended solids, chlorine, pH, and total phosphorus. The application for NPDES permits began in the mid-1970s. Reapplication for NPDES permits every five years requires analyses of over 120 analytes, including some RCRA-regulated constituents. Analytical reports from these water analyses are not included in this work plan, which is concerned with PCOCs that may have accumulated in soil from discharges in the early 1960s.

The only sections of the storm drain considered as potential direct sources of exposure to the public are two open concrete and rock-lined ditches east of TA-3-261 and north of TA-3-207, the natural channel between the designated outfall [SWMUs 3-013(a,b) and 3-052(f)], and the channel running south of TA-3-443. The remainder of the storm drain is underground. The outfall and associated drainage also receive a significant amount of runoff from parking lots and the surrounding areas.

5.~~26~~25.2 Investigation Summary

SWMU 3-052(f) was characterized during the summer 1994 investigation of SWMUs 3-013(a,b). SWMU 3-052(f) is the outfall that received discharges from several sources, including the drains identified as SWMUs 3-013(a,b). The sampling and analysis plan presented in Subsection 5.9 of the July 1993 RFI Work Plan for OU 1114 describes the investigation rationale, sampling approach, and laboratory analyses implemented to characterize SWMUs 3-013(a,b) (LANL 1993, 1090). The investigation involved characterization of

outfall SWMU 3-052(f) through the collection and analysis of five sediment samples for Appendix VIII metals, PCBs, SVOCs, and VOCs. The sediment samples were collected in sediment catchment basins from 10 to 50 ft downstream of the outfall pipe. Data from these samples will be used to characterize this SWMU and results will be documented in future RFI reports for OU 1114.

26 C-3-042:

5.29 Former Containment Sump West of TA-3-218

26

5.29.1 Description and History

Area of concern C-3-042 is a former containment sump located west of TA-3-218 used for secondary containment of a wooden surge tank that contained dielectric mineral oil used as insulation in experiments. The containment sump consisted of a 43 ft long by 27 ft wide concrete pad surrounded by an 18-in. to 20-in. high cement curb. The wooden surge tank was erected on the containment sump in approximately 1965. When heavy rains occurred, water filled the containment area. At times, the water had an oily film (possibly from leaks in the pumps and or piping) that would occasionally overflow to surrounding soil and gravel (Sobojinski 1992, 17-688).

The area surrounding the containment sump was enclosed by a chainlink fence and served as a storage yard for old electrical equipment for approximately 20 years. Most stored capacitors were labeled as non-PCB equipment containing PCBs in quantities less than 50 ppm. In 1985 the surge tank, chainlink fence, and curbing around the cement pad were removed (Sobojinski 1992, 17-688). The curb of the containment sump, the concrete pad, and many of the transformers and capacitors were removed in 1988. While there were no known releases other than occasional overflow from the containment sump, sampling was not done to determine if hazardous constituents were present.

5.29.2 Investigation Summary

C-3-042 was characterized during the summer 1992 investigation of the waste oil storage areas aggregate [SWMU 3-003(a)]. The sampling and analysis plan presented in Subsection 5.10 of the July 1993 RFI Work Plan for OU 1114 describes the investigation rationale, sampling approach, and laboratory analyses implemented to characterize SWMU 3-003(a) (LANL 1993, 1090). The investigation involved the collection and analysis of 17 surface soil samples and 2 asphalt chip samples for PCBs. Two random confirmatory samples were also submitted for analysis of SVOCs, VOCs, and Appendix VIII metals. Data from these samples will be used to characterize the AOC and results will be documented in future RFI reports for OU 1114.

5.30 Outfalls from Cooling Towers

5.30.1 Description and History

The PRSs included in this aggregate are SWMUs 3-045(b) and 3-048(c). Both SWMUs are located in the upper portion of Sandia Canyon directly south of the steam plant (LANL 1993, 17-926).

SWMU 3-045(b) is identified as the outfall from cooling towers TA-3-25 and TA-3-58 which serve the power plant TA-3-22 (LANL 1993, 17-926). This discharge point is identified as NPDES permitted outfall EPA 01A001 and is identical to SWMU 3-012(b) from the 1993 RFI Work Plan for OU 1114 (LANL 1993, 1090). Cooling tower TA-3-25 was demolished in 1990, and only the concrete basin remains. Cooling tower TA-3-58 remains in operation (LANL 1993, 17-926).

The outfall receives effluent from the neutralization tank, the chlorine building, and cooling tower TA-3-58 effluent. The neutralization tank receives blowdown from the boilers and wastewater from the water treatment area. The pH of the wastewater in the neutralization tank is adjusted by adding either sulfuric acid or sodium hydroxide, as appropriate, before it is released to the outfall. This adjustment ensures that the pH is maintained between six and nine (LANL 1990, 17-824).

Storm water that collects in the concrete foundation basin from TA-3-25 also flows to this outfall from leaking pipe valves that were previously connected to the cooling system. May 20, 1990, a one-time release of sulfuric acid was discharged to this outfall. During this release, excess sulfuric acid was released into the neutralization tank used for treatment of boiler blowdown and demineralizer discharge. Overflow from the neutralization tank combined with cooling water and was discharged to the outfall. Low pH values were observed in a 2.5-mile section of the watercourse below the outfall. Soda ash was manually added to the entire 2.5-mile watercourse after the release. On May 23, 1990, a subsequent pH survey conducted along this section of watercourse detected no pH measurements below 6.9 (LANL 1990, 17-824).

In accordance with the NPDES permit, water samples are collected at the outfall based on standard parameters for industrial wastewater systems, and analyzed for total suspended solids, pH, and chlorine (EPA 001, pp. V1 - V9, 1986, 17-719).

SWMU 3-045(c) is an outfall identified by NPDES permit number EPA 03A027 and is located approximately 110 ft east of SWMU 3-012(b) (outfall EPA 01A001). This outfall only receives effluent from cooling tower TA-3-285 which serves the generators powering the Laboratory computer system (LANL 1993, 17-926). Currently the Laboratory monitors and reports flow rate, total suspended solids, chlorine, pH, and total phosphorus for this outfall.

Both outfalls SWMU 3-045(b) and SWMU 3-045(c) may have received intentionally applied chemicals prior to being NPDES permitted. These chemicals were used to inhibit corrosion and algae growth in the cooling towers, as well as for cleaning purposes. Chromium-based water treatment chemicals were used from June 1956 until approximately 1970. At the time of the initial site visit, there was no evidence of damaged vegetation or staining in the vicinity of either outfall (LANL 1993, 17-926).

5.30.2 Investigation Summary

SWMUs 3-045(b) and 3-045(c) were evaluated during the summer 1994 investigation of the sanitary treatment system aggregate. The sampling and analysis plan presented in Subsection 5.5 of the July 1993 RFI Work Plan for OU 1114 described the investigation rationale, sampling approach, and laboratory analyses implemented to characterize SWMUs 3-012(b), and 3-045(b,c) (LANL 1993, 1090). The investigation involved characterization of the power plant outfall through the collection and analysis of five sediment samples for PCBs, Appendix VIII metals, SVOCs, VOCs, pesticides, herbicides, and radionuclides. The RFI work plan originally called for two samples to be collected from SWMU 3-012(b) at the outfall; however, an additional three samples were collected approximately 25 ft to 50 ft downstream from the outfall. Data from these samples will be used to characterize these SWMUs and results will be documented in future RFI reports for OU 1114.

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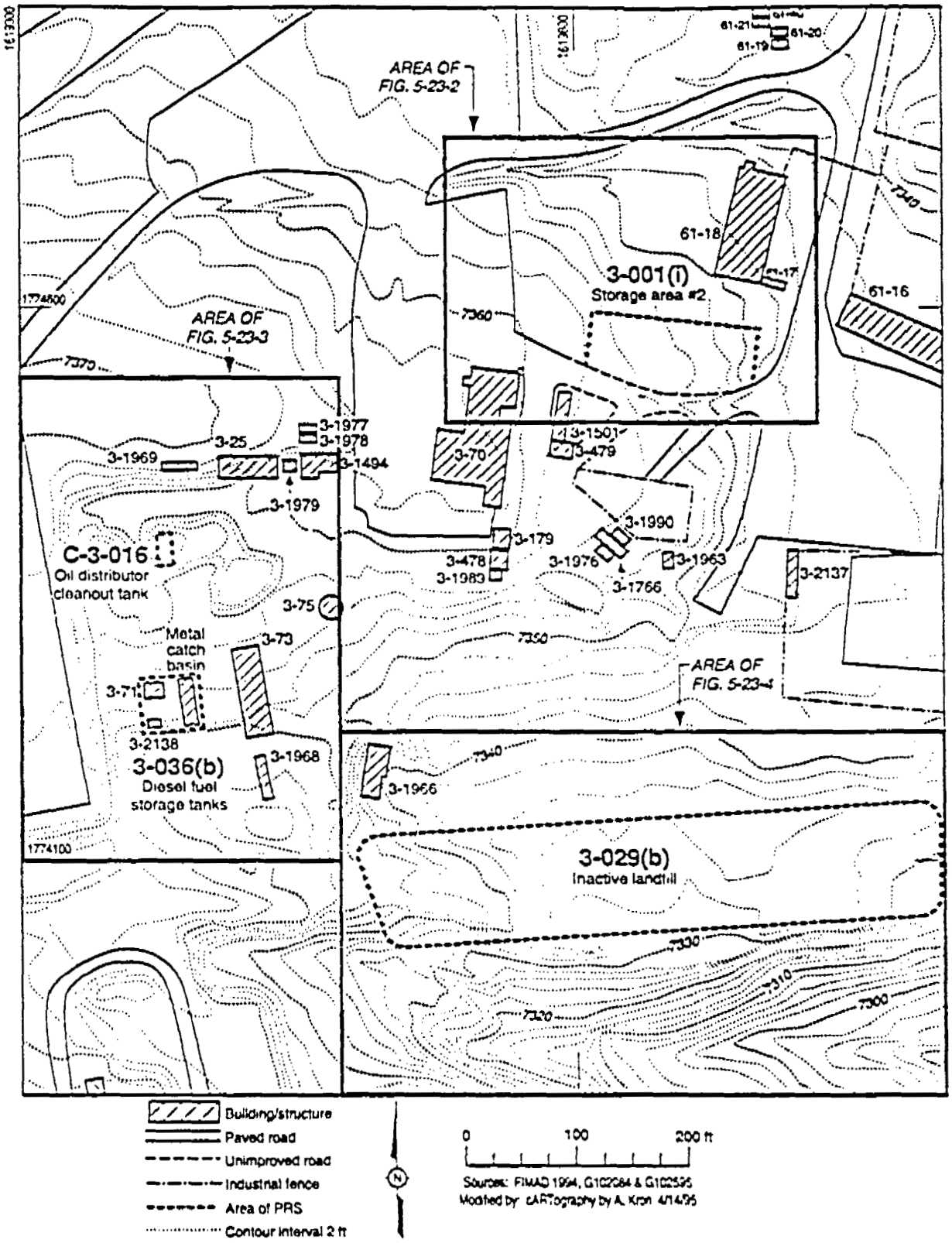
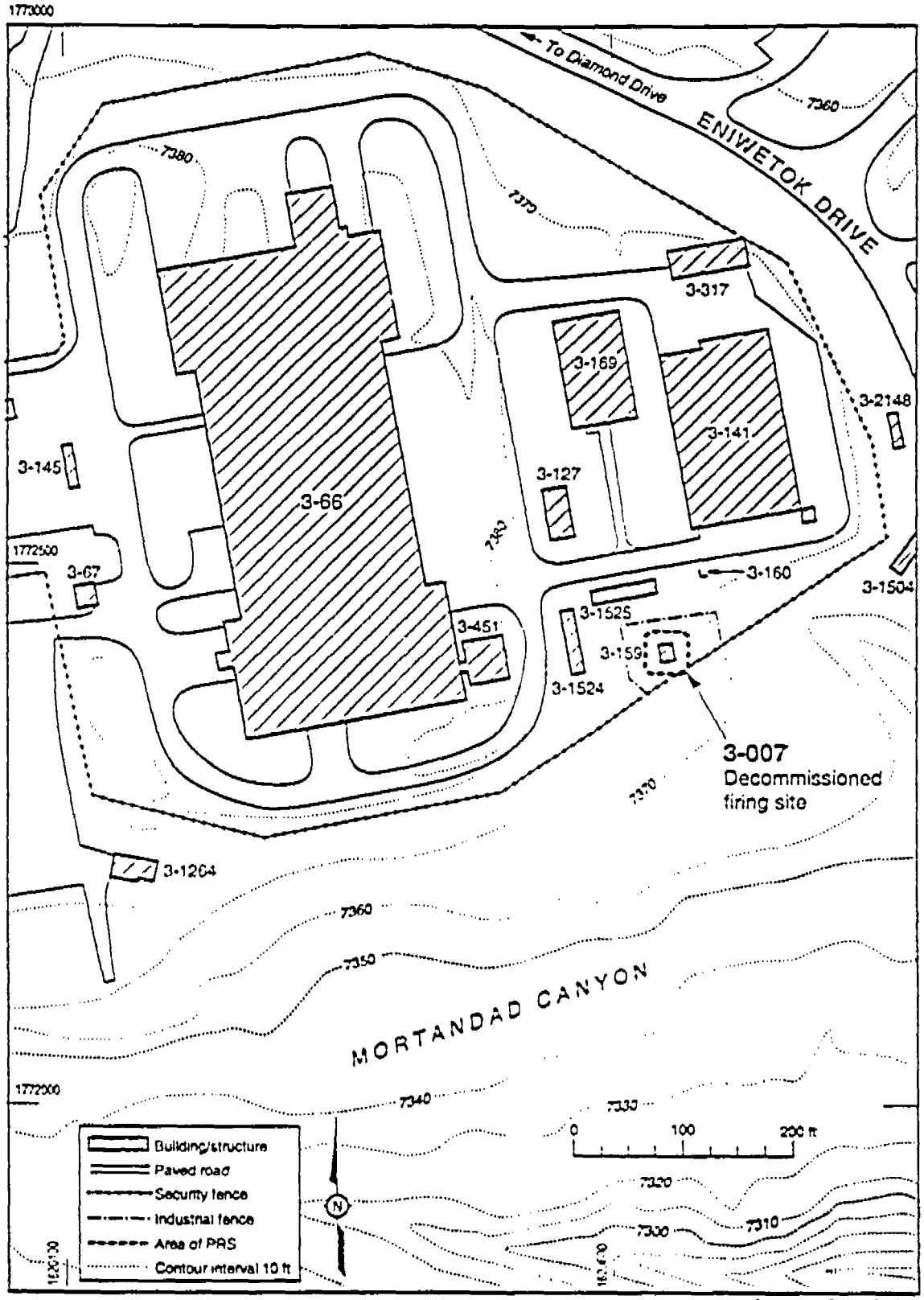


Fig. 5-23-1. Site location map of SWMU 3-001(i), SWMU 3-029(b), C-3-016 and C-3-036(b).



Source: FIMAD 1994, G102086
Modified by: cARTography by A. Kron 4/14/95

Fig. 5-25-1. Site location map of SWMU 3-007.

TABLE 5-12-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMU 3-054(e) and C-3-006, MORTANDAD CANYON OUTFALL

SAMPLE DESCRIPTION					FIELD SCREEN			LABORATORY ANALYSIS				
								Radio-nuc-lides	Organics			Metal[1]
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	ISO-Pu, ISO-U, gamma spec., tritium	VOCs (SW 8240)	PCBs (SW 8080)	SVOCs (SW 8270)	Appendix VIII metals (SW 6010, 7000)
Mortandad Canyon												
Depositional area 1	2	0-12	2		2	2	2	2		2	2	2
		s-t[5]	2		2	2	2	2		2	2	2
Depositional area 2	2	0-12	2		2	2	2	2		2	2	2
		s-t[5]	2		2	2	2	2		2	2	2
Depositional area 3	2	0-12	2		2	2	2	2		2	2	2
		s-t[5]	2		2	2	2	2		2	2	2
QC samples[1]												
Field duplicate	1	TBD	1		1	1	1	1	1		1	1
Field collocated	1	TBD	1		1	1	1	1	1		1	1
Rinsate blank	NA	NA	1					1			1	1
Confirmatory samples	2	TBD	2		2	2	2		2[4]			
TOTALS	10		17		16	16	16	15	4	12	15	15

[1]QC samples are determined using guidelines outlined in the site specific QAPjP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
[4]Represents minimum number of confirmatory samples to be submitted for VOCs based on field screening results. Actual number may vary.
[5]s-t = soil/tuff interface (12 in. interval above interface)
NA = Not applicable.
TBD = To be determined in the field.

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TABLE 5-13-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMU 3-049(a), TA-3-66 OUTFALL

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LABORATORY ANALYSIS			
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	Radionuclides: Isotopic uranium	Organics: VOCs (SW 8240)	Metals: Appendix VIII metals (SW 6010,7000)	Misc.: Cyanide (SW 9010, 9012)
Sediment catchment basin 1	2	0–s/l[5]	2		2	2	2	1		2	2
Sediment catchment basin 2	2	0–12	2		2	2	2	1		2	2
		s/l[5]	2		2	2	2			2	2
Sediment catchment basin 3	2	0–12	2		2	2	2	1		2	2
		s/l[5]	2		2	2	2			2	2
Sediment catchment basin 4	2	0–12	2		2	2	2	1		2	2
		s/l[5]	2		2	2	2			2	2
QC samples[1]											
Field duplicate	1	TBD	1		1	1	1	1		1	1
Rinsate blank	NA		1					1		1	1
Confirmatory samples (sediment)	2	TBD	2		2	2	2		2[4]		
Confirmatory samples (water)	2	NA	2		2	2	2		2[4]		
TOTALS	13		20		19	19	19	6	4	16	16

[1]QC samples are determined using guidelines outlined in the site specific QAPjP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
[4]Represents minimum number of confirmatory samples to be submitted for VOCs based on field screening results. Actual number may vary.
[5]s/l = soil/tuff interface (12-in. interval above interface)
NA = Not applicable.
TBD = To be determined in the field.

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TABLE 5-14-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMU 3-021, COMPRESSED GAS FACILITY OUTFALL

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LAB ANALYSIS		
								Organics		Metals
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in.)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	VOCs (SW 8240)	SVOCs (SW 8270)	Appendix VIII metals (SW 6010,7000)
Outfall pipe trench										
Trench 1	3	12-in. below t's[5]	3		3	3	3		3	3
Northeast trending ditch										
Trench 2	3	12-in. below t's[5]	3		3	3	3		3	3
QC samples[1]										
Field duplicate	1	TBD	1		1	1	1		1	1
Confirmatory samples	2	TBD	2		2	2	2	2[4]		
TOTALS	9		9		9	9	9	2	7	7

[1]QC samples are determined using guidelines outlined in the site specific QAPP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
[4]Represents minimum number of confirmatory samples to be submitted for VOCs based on field screening results. Actual number may vary.
[5]t's = fill/soil interface.
[6]f/f = fill/fill interface.
NA = Not applicable.
TBD = To be determined in the field.

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TABLE 5-15-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMUs 3-052(b) and 3-056(k), STORM DRAIN SYSTEM AND STORAGE AREA

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LAB ANALYSIS		
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in.)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	Isotopic uranium	VOCs (SW 8240)	Appendix VIII metals (SW 6010, 7000)
SWMU 3-052(b)										
Biased sampling	5	0–12	5		5	5	5	5		5
		s.t.[5]	5		5	5	5	5		5
SWMU 3-056(k)										
Random sampling										
10-ft x 10-ft grid	9	Asphalt	9		9	9	9	9		
		0–12 (soil)	9		9	9	9	9		9
		s.t.[5]	9		9	9	9	9		9
QC samples[1]										
Field collocated	1	TBD	1		1	1	1	1		1
Rinsate duplicate	1	TBD	1		1	1	1	1		1
Confirmatory samples	2	TBD	2		2	2	2		2[4]	
TOTALS	18		41		41	41	41	39	2	30

[1]QC samples are determined using guidelines outlined in the site specific QAPP, Annex B, Note 2A of this work plan. Location is determined by the Field Team Leader.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
[4]Represents minimum number of confirmatory samples to be submitted for VOCs based on field screening results. Actual number may vary.
[5]s.t. = soil/tuff interface (12-in. interval above interface)
NA = Not applicable.
TBD = To be determined in the field.

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Should this be Tab. 5-16-1?

TABLE 5-16-2

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMUs 3-054(b) and 3-052(a and e), TWOMILE CANYON OUTFALL

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LAB ANALYSIS			
									Organics		Metals
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in.)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	Gross alpha/beta, gamma spec., and tritium	VOCs (SW 8240)	SVOCs (SW 8270)	Appendix VIII metals (SW 6010, 7000)
Canyon outfall											
First transect	3	0–12	3		3	3	3			3	3
		s.t.[5]	3		3	3	3			3	3
Second transect	3	0–12	3		3	3	3			3	3
		s.t.[5]	3		3	3	3			3	3
Third transect	3	0–12	3		3	3	3			3	3
		s.t.[5]	3		3	3	3			3	3
QC samples[1]											
Field collocated	1	TBD	1		1	1	1			1	1
Rinsate blank	NA	NA	2							1	1
Confirmatory samples	5	TBD	5		5	5	5	2[4]	3[4]		
TOTALS	15		26		24	24	24	2	3	--	--

[1]QC samples are determined using guidelines outlined in the site specific QAPP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
[4]Represents minimum number of confirmatory samples to be submitted for VOCs based on field screening results. Actual number may vary.
[5]s.t. = soil/tuff interface (12 in. interval above interface).
NA = Not applicable.
TBD = To be determined in the field.

Should this be a footnote w/ "under Gross a/b, gamma definition for Conf. sample"?

TABLE 5-17-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMU 3-001(c), FORMER WASTE OIL STORAGE AREA

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LAB ANALYSIS		FIELD LAB ANALYSIS		
								Radionuclides		Organics		Metal
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in.)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	ISO-PU, ISO-U, gamma spectroscopy	Tritium[5]	VOCs (SW 8240)	TPH (SW 8015)	Appendix VIII metals (SW 6010, 7000)
Soil underlying removed												
sump	6	0-12	6		6	6	6	6	6		6	6
		12-24[6]	6		6	6	6				6	
Confirmatory field samples	6	s1[7]	6		6	6	6	6	6	6	6	6
QC samples[1]												
Field collocated	1	TBD	1		1	1	1	1	1		1	1
Rinsate blank	NA	NA	1						1	1		1
Confirmatory samples	2	TBD	2		2	2	2			2[4]		
TOTALS	15		22		21	21	21	13	14	9	19	14

[1]QC samples are determined using guidelines outlined in the site specific QAPP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
[4]Represents minimum number of confirmatory samples to be submitted for VOCs based on field screening results. Actual number may vary.
[5]Tritium will be analyzed in soil moisture and in TPH.
[6]Intervals below the 12-24 in. interval will only be collected if TPH is found in either of the two overlying intervals. Sampling will be terminated when two successive intervals contain no detectable TPH or when tuff is encountered.
[7]s1 = soil tuff interface (12-in. interval above interface)
NA = Not applicable
TBD = To be determined in the field

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TABLE 5-18-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMUs 3-056(l) and 3-051(c), AREAS OF OIL STAINING ADJACENT TO TA-3-141

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LAB ANALYSIS				
								Radionuclides		Organics		Metals
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	Gross alpha/beta, gamma spectroscopy	Tritium	VOCs (SW 8240)	TPH (SW 8015)	Appendix VIII metals (SW 6010, 7000)
Area of staining												
Area 1	1	0–12 below grave	1		1	1	1	1	1		1	1
		s/t[5]	1		1	1	1	1	1		1	1
Area 2	1	0–12 below grave	1		1	1	1	1	1		1	1
		s/t[5]	1		1	1	1	1	1		1	1
Area 3	1	0–12 below grave	1		1	1	1	1	1		1	1
		s/t[5]	1		1	1	1	1	1		1	1
Chip samples	2	0.6	2		2	2	2	2	2			2
QC samples[1]												
Field collocated	1	TBD	1		1	1	1	1	1	1	1	1
Confirmatory samples	2	TBD	2		2	2	2			2[4]		
TOTALS	8		11		11	11	11	9	9	3	7	9

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[1]QC samples are determined using guidelines outlined in the site specific QAPjP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
[4]Represents minimum number of confirmatory samples to be submitted for VOCs based on field screening results. Actual number may vary.
[5]s/t = soil/tuff interface (12-in. interval above interface)
TBD = To be determined in the field

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TABLE 5-18-3

SCREENING AND ANALYSIS FOR OU 1114 SAMPLING PLAN SUMMARY FOR SWMU 3-034(a) RADIOACTIVE WASTE USTs

		SAMPLE DESCRIPTION						FIELD SCREEN		FIELD LABORATORY				LABORATORY ANALYSIS											
														Radionuclides			Organics							Metal	Misc
SAMPLING LOCATION/TYPE	SAMPLE LOCATION DESCRIPTION	Sample depth (feet)	Sample I.D. number	Field duplicate	Field split	Collocated sample	Total samples	Radiation screen[1]	Organic vapor screen	Rad van analysis[2]	Rad van tritium	GC/FID for TPH (SW 8015)	Immunoassay kit for PCBs (SW 4020)	Gross alpha/beta/gamma	Isotopic analyses[3]	Tritium	Herbicides (SW 8150)	Organochlorine pesticides (SW 8080)	Organophosphorous pesticides (SW 8140)	PCBs (SW 8080)	SVOCs (SW 8270)	TPH (SW 8015)	VOCs (SW 8240)	Appendix VIII metals (SW6010, 7000)	Cyanide (SW 9010, 9012)
Stainless Steel Tank #1	Grab/swipe	—		1			2	2	2	2					2						2		2	2	
	BH-1	15					1	1	1	1					•						•		•	1	
		20					1	1	1	1					•						•		•	1	
		25					1	1	1	1					•						•		•	1	
		30					1	1	1	1					•						•		•	1	
Stainless Steel Tank #2	Grab/swipe	—					1	1	1	1					1						1		1	1	
	BH-2	15					1	1	1	1					•						•		•	1	
		20		1			2	2	2	2					2						2		2	2	
		25					1	1	1	1					•						•		•	1	
		30					1	1	1	1					•						•		•	1	
Concrete Tank #1	Grab/swipe	—					1	1	1	1					1						1		1	1	
	BH-3	10					1	1	1	1					•						•		•	1	
		15					1	1	1	1					•						•		•	1	
		20					1	1	1	1					•						•		•	1	
		25					1	1	1	1					•						•		•	1	
		30					1	1	1	1					•						•		•	1	
TOTAL NUMBER OF SAMPLES				2			18	18	18	18					18						18		18	18	

[1]Gross alpha, beta, and gamma using field instrumentation
[2]Gross alpha, beta, and gamma using mobile laboratory instrumentation
[3]Specific isotopic analyses described in the text
• = Analyses will only be conducted if field screening indicates elevated levels

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TABLE 5-18-3 (continued)

SCREENING AND ANALYSIS FOR OU 1114 SAMPLING PLAN SUMMARY FOR SWMU 3-034(a) RADIOACTIVE WASTE USTs

		SAMPLE DESCRIPTION						FIELD SCREEN		FIELD LABORATORY				LABORATORY ANALYSIS											
														Radionuclides			Organics							Acid	Wsc
SAMPLING LOCATION/TYPE	SAMPLE LOCATION DESCRIPTION	Sample depth (feet)	Sample I.D. number	Field duplicate	Field split	Collocated sample	Total samples	Radiation screen[1]	Organic vapor screen	Rad van analysis[2]	Rad van tritium	GC/FID for TPH (SW 8015)	Immunoassay kit for PCBs (SW 4020)	Gross alpha/beta/gamma	Isotopic analyses[3]	Tritium	Herbicides (SW 8150)	Organochlorine pesticides (SW 8080)	Organophosphorous pesticides (SW 8140)	PCBs (SW 8080)	SVOCs (SW 8270)	TPH (SW 8015)	VOCs (SW 8240)	Appendix VIII metals (SW6010, 7000)	Cyanide (SW 9010, 9012)
Concrete Tank #2	Grab/swipe	—					1	1	1	1					1						1		1	1	
	DH 4	10					1	1	1	1					•						•		•	1	
		15					1	1	1	1					•						•		•	1	
		20		1			2	2	2	2					2						2		2	2	
		25					1	1	1	1					•						•		•	1	
		30					1	1	1	1					•						•		•	1	
Outlet Sump Pit	Grab/swipe	—					1	1	1	1					1						1		1	1	
TOTAL NUMBER OF SAMPLES				1			8	8	8	8					8						8		8	8	

[1]Gross alpha, beta, and gamma using field instrumentation
[2]Gross alpha, beta, and gamma using mobile laboratory instrumentation
[3]Specific isotopic analyses described in the text
• = Analyses will only be conducted if field screening indicates elevated levels

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TABLE 5-19-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMU 3-059(b) and C-3-014, PRESS BUILDING EXHUST OUTLET AND EQUIPMENT STORAGE AREA

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LABORATORY ANALYSIS				
								Radionuclides	Organics			Metals
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	Isotopic uranium	VOCs (SW 8240)	PCBs (SW 8080)	TPH (SW 8270)	Appendix VIII metals (SW 6010, 7000)
Biased locations												
Exhaust outlet soils;	3	0–12 below base course	3		3	3	3			3	3	3
10-ft x 8-ft area												
Low area (1)	3	0–12 below base course	3		3	3	3			3	3	3
Low area (2)	3	0–12 below base course	3		3	3	3			3	3	3
Random locations												
Soil (10-ft x 10-ft area)	9	0–12 below base course	9		9	9	9			9	9	9
		Asphalt	9 max		9		9	9				
QC samples[1]												
Field duplicate	1	TBD	1		1	1	1	1		1	1	1
Confirmatory samples	4	TBD	4		4	4	4	2[4]	2[4]			
TOTALS	23		23		32	23	32	12	2	19	19	19

[1]QC samples are determined using guidelines outlined in the site specific QAPP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
[4]Represents minimum number of confirmatory samples to be submitted for VOCs based on field screening results. Actual number may vary.
TBD = To be determined in the field.

TABLE 5-20-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMU 3-047(d), STORAGE AREA

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LAB ANALYSIS		
								Organics		Metals
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in.)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	VOCs (SW 8240)	TPH (SW 8015)	Appendix VIII metals (SW 6010, 7000)
Random sampling										
2.5-ft x 2.5-ft grid	6	0–12	6		6	6	6	6	6	6
		s/l[4]	6		6	6	6	6	6	6
QC samples[1]										
Field collocated	1	TBD	1		1	1	1	1	1	1
Rinsate blank										
TOTALS	7		13		13	13	13	13	13	13

[1]QC samples are determined using guidelines outlined in the site specific QAPP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
[4]s/l = soil/tuff interface (12-in. interval above interface)
TBD = To be determined in the field

TABLE 5-21-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMU 3-003(p), SOIL CONTAMINATION FROM FORMER STORAGE AREA

SAMPLE DESCRIPTION					FIELD SCREEN			LABORATORY ANALYSIS				
								Organics				Metals
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in.)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	VOCs (SW 8240)	SVOCs (SW 8270)	PCBs (SW 8080)	TPH (SW 8015)	Appendix VIII metals (SW 6010, 7000)
20-square-ft area	4	0–12	4		4	4	4	4	4	4	4	4
		s/t[4]	4		4	4	4	4	4	4	4	4
QC samples[1]												
Field duplicate	1	TBD	1		1	1	1	1	1	1	1	1
Confirmatory samples												
TOTALS	5		9		9	9	9	9	9	9	9	9

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[1]QC samples are determined using guidelines outlined in the site specific QAPjP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
[4]s/t = soil/tuff interface (12-in. interval above interface)
TBD = To be determined in the field

TABLE 5-22-1

SCREENING AND ANALYSIS FOR OU 1114
PHASE I SAMPLING PLAN SUMMARY OF
SWMUs 3-059 and 3-003(n),
FORMER JCI SALVAGE YARD

SAMPLE DESCRIPTION					FIELD SCREEN			FIELD LABORATORY ANALYSIS					FIXED LABORATORY ANALYSIS					
								Organics				Metals		Organics			Metals	
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	VOCs (SW 8240)	SVOCs (SW 8270)	PCBs (SW 8080)	TPH (SW 418.1)	Appendix VIII metals XRF or LIBS	Gross alpha/beta, gamma spec., tritium	VOCs (SW 8240)[5]	SVOCs (SW 8270)[5]	TPH (SW 418.1)[5]	PCBs (SW 8080)[5]	Appendix VIII metals (SW 6010, 7000)[5]
SWMU 3-059																		
Biased sampling	8	Asphalt	8		8	8	8			8								
	24	0-12	24		24	24	24		16	24	16	24						
		12-24[4]	24		24	24	24		24	24	24	24						
Random sampling	12	Asphalt	12		12	12	12			12								
	13	0-12	13		13	13	13		1	13	1	13						
		12-24[4]	13		13	13	13		13	13	13	13						
Confirmatory samples	3	TBD	3		3	3	3	3					3	3	2	3	3	3
SWMU 3-003(n)																		
Biased sampling	4	0-12	4							4	4	4						
		st[4]	4							4	4	4						
Random sampling	9	0-12	9							9	9	9						
		st[4]	9							9	9	9						
Confirmatory samples	2	TBD	2		2	2	2	2						2		2	2	2
QC samples[1]																		
Trip blank	NA	NA	1											1				
Field duplicate	1	TBD	1		1	1	1		1	1		1						
Field collocated	1	TBD	1		1	1	1		1	1		1						
Rinsate blank	NA	NA	1											1	1			1
TOTALS	77		129		101	101	101	5	56	122	80	102	3	7	3	5	5	6

[1]QC samples are determined using guidelines outlined in the site specific QAPjP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
[4]Samples between the 0-12 in. soil interval and the soil fill (st) interface will only be collected if constituent are found in the prior depth interval.
[5]Confirmation samples will be collected and submitted to a fixed laboratory if no constituents are found in the first soil interval sampled for each FCOC.
NA = Not applicable
TBD = To be determined in the field

what about footnote "5" - doesn't appear in table

TABLE 5-22-1 (p. 2)

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMU 3-059 FORMER JCI SALVAGE YARD

SAMPLE DESCRIPTION					QC SAMPLES[1]				FIELD SCREEN		FIELD LAB		LABORATORY ANALYSIS				
													Radionuclides	Organics			Metals
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in.)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Trip blank	Field blank	Field duplicate	Rinsate blank	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	Chem van analysis[4]	Radionuclides[5]	VOCs (SW 8240)[5]	SVOCs (SW 8270)	PCBs (SW 8080)	Appendix VIII metals (SW6010, 7000)
Outside southern boundary	2	Asphalt	2						2		2					2	
		0-6	2						2	2	2	2					
		6-18	2						2	2	2	2*					
		18-30	2						2	2	2	2*					
		30-42	2						2	2	2	2*					
Outside easthern boundary	2	Asphalt	2						2		2					2	
		0-6	2						2	2	2	2					
		6-18	2						2	2	2	2*					
		18-30	2						2	2	2	2*					
		30-42	2						2	2	2	2*					

*Note: Samples will be collected at depths greater than 6 in. *only* if results from the on site lab for the 0-6 in. interval are greater than SALS

[1]QC samples are based on estimated number of days in the field and total number of samples collected. This number may vary based on actual field conditions

[2]Gross alpha, beta, and gamma using field instrumentation.

[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.

[4]Mobile on site chemical van analysis will include PCBs, SVOCs and XRF metal analyses; VOC analysis will be included if required by field screening results

[5]Represents minimum number of confirmation samples to be submitted for VOCs and radiological constituents (gross alpha/beta analysis, gamma spectroscopy and tritium analysis) based on field screening results. Actual number may vary.

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TABLE 5-22-1 (p. 3)

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMU 3-059 FORMER JCI SALVAGE YARD

SAMPLE DESCRIPTION					QC SAMPLES[1]				FIELD SCREEN		FIELD LAB		LABORATORY ANALYSIS				
													Radio nuc-lides	Organics			Metals
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Trip blank	Field blank	Field duplicate	Rinsate blank	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	Chem van analysis[4]	Radionuclides[5]	VOCs (SW 8240)[5]	SVOCs (SW 8270)	PCBs (SW 8080)	Appendix VIII metals (SW6010, 7000)
Outside western boundary	2	Asphalt	2						2		2					2	
		0-6	2						2	2	2	2					
		6-18	2						2	2	2	2*					
		18-30	2						2	2	2	2*					
		30-42	2						2	2	2	2*					
Unpaved area of yard																	
Two sites in two areas	4	0-6	4						4	4	4	4					
		6-18	4						4	4	4	4					
		18-30	4						4	4	4	4*					
		30-42	4						4	4	4	4*					
Drainage area	2	0-6	2						2	2	2	2					
		6-18	2						2	2	2	2*					
		18-30	2						2	2	2	2*					
		30-42	2						2	2	2	2*					

*Note: Samples will be collected at depths greater than 6 in. only if results from the on site lab for the 0-6 in. interval are greater than SALS

[1]QC samples are based on estimated number of days in the field and total number of samples collected. This number may vary based on actual field conditions

[2]Gross alpha, beta, and gamma using field instrumentation.

[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation

[4]Mobile on site chemical van analysis will include PCBs, SVOCs and XRF metal analyses. VOC analysis will be included if required by field screening results

[5]Represents minimum number of confirmation samples to be submitted for VOCs and radiological constituents (gross alpha beta analysis, gamma spectroscopy and tritium analysis) based on field screening results. Actual number may vary.

rev 11/29/94

TABLE 5-22-1 (p. 4)

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMU 3-059 FORMER JCI SALVAGE YARD

SAMPLE DESCRIPTION					QC SAMPLES[1]				FIELD SCREEN		FIELD LAB		LABORATORY ANALYSIS				
													Radio nuc-lides	Organics			Metal
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in.)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Trip blank	Field blank	Field duplicate	Rinsate blank	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	Chem van analysis[4]	Radionuclides[5]	VOCs (SW 8240)[5]	SVOCs (SW 8270)	PCBs (SW 8080)	Appendix VIII metals (SW6010, 7000)
Random sampling																	
25-ft x 25-ft grid	7	Asphalt	7						7		7					7	
		0-6	7						7	7	7	7					
		6-18	7						7	7	7	7*					
		18-30	7						7	7	7	7*					
		30-42	7						7	7	7	7*					
QC samples					6	6	6	6									
Confirmatory samples																	
Soil													3	3	3	3	3
Asphalt													2				
TOTALS	25		119		6	6	6	6	119	100	119	100	5	3	3	22	3

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[1]Note: Samples will be collected at depths greater than 6 in. only if results from the on site lab for the 0-6 in. interval are greater than SALS.
[1]QC samples are based on estimated number of days in the field and total number of samples collected. This number may vary based on actual field conditions.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
[4]Mobile on site chemical van analysis will include PCBs, SVOCs and XRF metal analyses; VOC analysis will be included if required by field screening results.
[5]Represents minimum number of confirmation samples to be submitted for VOCs and radiological constituents (gross alpha/beta analysis, gamma spectroscopy and tritium analysis) based on field screening results. Actual number may vary.

TABLE 5-22-2

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMU 3-003(n) STORAGE AREA SURROUNDING PCB OIL SPILL

SAMPLE DESCRIPTION					QC SAMPLES[1]				FIELD SCREEN		FIELD LAB	LABORATORY ANALYSIS			
												Organics			Metal
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (m)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Trip blank	Field blank	Field duplicate	Rinsate blank	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	VOCs (SW 8240)[4]	PCBs (SW 8080)	TPH (SW 8015)	Appendix VIII metals (SW6010, 7000)
Random sampling															
5-ft x 5-ft grid	9	0-6	9						9	9	9		9	9	9
		6-12	9						9					9	
Biased sampling	4	0-6	4						4	4	4		4	4	4
		6-12	4						4					4	
QC samples					1	1	1	1							
Confirmatory samples												2			
TOTALS	13		26		1	1	1	1	26	13	13	2	13	26	13

[1]QC samples are based on estimated number of days in the field and total number of samples collected. This number may vary based on actual field conditions.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation. rev 12/9/94
[4]Represents minimum number of confirmation samples to be submitted for VOCs based on field screening results. Actual number may vary

TABLE 5-23-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMUs 3-001(i), 3-029(b), 3-036(b), and C-3-016, ASPHALT BATCH PLANT AGGREGATE

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LAB ANALYSIS			
								Organics			
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	VOCs (SW 8240) (BTEX)	SVOCs (SW 8270)	PCBs (SW 8080)	TPH (SW 8015)
SWMU 3-001(i)											
Random grid 10 x 10 ft	9	0–12 in.	9		9	9	9	9		9	9
AOC C-3-016											
Biased samples	4	0–12 in.	4		4	4	4	4	4		4
		36–43 in.	4		4	4	4	4	4		4
Confirmatory samples	4	TBD	4		4	4	4	4	4		4
SWMU 3-036(b)											
Biased samples	6	0–12 in.	6		6	6	6	6	6		6
Confirmatory samples	6	TBD	6		6	6	6	6	6		6
SWMU 3-029(b)											
Trench 1	6	5–15 ft	6		6	6	6	6	6		6
Trench 2	6	5–15 ft	6		6	6	6	6	6		6
Trench 3	6	5–15 ft	6		6	6	6	6	6		6
QC samples[1]											
Trip blank	NA	NA	1					1			
Rinsate blank	NA	NA	2					2	2		2
Field duplicate	2	TBD	2		2	2	2	2	2	2	2
Field collocated	2	TBD	2		2	2	2	2	2	2	2
TOTALS	51		58		55	55	55	58	48	13	57

[1]QC samples are determined using guidelines outlined in the site specific QAPjP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
NA = Not applicable
TBD = To be determined in the field

TABLE 5-24-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMU 3-034(a), RADIOACTIVE LIQUID WASTE UNDERGROUND STORAGE TANKS

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LAB ANALYSIS			FIELD LAB
								Radionuclides	Organics		Metals
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in.)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	ISO-PU, ISO-U, gamma spec., SR-90	VOCs (SW 8240)	LANL parameters[5]	Gross alpha/beta, gamma spectroscopy
Concrete USTs											
Top of concrete USTs	4	8-9	4		4	4	4			4	4[6]
Above bottom of USTs	4	13-14	4		4	4	4			4	4[6]
Below bottom of USTs	4	15-16	4		4	4	4			4	4[6]
QC samples[1]											
Field duplicate	1	TBD	1		1	1	1	1		1	
Rinsate blank	NA	NA	1								
Confirmatory samples	4	TBD	4		4	4	4	4[4]	4[4]		
TOTALS	17		18		17	17	17	5	4	13	12

[1]QC samples are determined using guidelines outlined in the site specific QAPjP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
[4]Represents minimum number of confirmatory samples to be submitted for VOCs based on field screening results. Actual number may vary.
[5]The Laboratory's Waste Management Group will identify hazardous constituents to be tested prior to initiating field activities.
[6]Potential number of samples collected to guide additional drilling activies (number may vary)
NA = Not applicable
TBD = To be determined in the field

TABLE 5-25-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMU 3-007, DECOMMISSIONED FIRING SITE

SAMPLE DESCRIPTION					FIELD SCREEN			FIXED LABORATORY ANALYSIS				
								Radio-nuc-lides	Organics		Metals	Misc
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	Isotopic thorium	VOCs (SW 8240)	SVOCs (SW 8270)	Appendix VIII metals (SW 6010, 7000)	High explosives (USATHAMA)
Biased sampling												
Outside of exterior walls	6	0–12	6		6	6	6	6		6	6	6
on the north and east side												
QC samples[1]												
Field collocated	1	TBD	1		1	1	1	1		1	1	1
Confirmatory samples	2	6–12	4		2	2	2		2[4]			
TOTALS	9		11		9	9	9	7	2	7	7	7

[1]QC samples are determined using guidelines outlined in the site specific QAPjP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
[4]Represents minimum number of confirmatory samples to be submitted for VOCs based on field screening results. Actual number may vary.
TBD = To be determined in the field

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TABLE 5-26-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMUs 3-004(c and d), DUMPSTER AREAS BEHIND THE CMR BUILDING

SAMPLE DESCRIPTION					FIELD SCREEN			LABORATORY ANALYSIS			
								Radionuclides	Organics		Metals
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in)	TOTAL No. of SAMPLES	SAMPLE I.D. NUMBER	Radiation screening[2]	Organic vapor screening (PID/FID)	Rad van analysis[3]	ISO-PU, ISO-U, gamma spec.	VOCs (SW 8240)	SVOCs (SW 8270)	Appendix VIII metals (SW 6010, 7000)
SWMU 3-004(c)											
Dumpster area transects	8	Asphalt	8		8	8	8	8[6]			
		0–12	8		8	8	8			8	8
		s1[5]	8		8	8	8			8	8
Drainage area	1	Asphalt	1		1	1	1	1[6]			
		0–12	1		1	1	1			1	1
		s1[5]	1		1	1	1			1	1
SWMU 3-004(d)											
Dumpster area transects	8	0–12	8		8	8	8			8	8
		s1[5]	8		8	8	8			8	8
Drainage area	2	0–12	2		2	2	2			2	2
		s1[5]	2		2	2	2			2	2
QC samples[1]											
Field duplicate	1	TBD	1		1	1	1			1	1
Field collocated	1	TBD	1		1	1	1			1	1
Rinsate blank	NA	NA	1							1	1
Confirmatory samples	4	TBD	4		4	4	4	2[4]	2[4]		
TOTALS	25		54		53	53	53	11	2	41	41

[1]QC samples are determined using guidelines outlined in the site specific QAPjP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.
[2]Gross alpha, beta, and gamma using field instrumentation.
[3]Gross alpha, beta, and gamma using mobile laboratory instrumentation.
[4]Represents minimum number of confirmatory samples to be submitted for VOCs based on field screening results. Actual number may vary.
[5]s1 = soil/fill interface (12 in. interval above interface)
[6]Asphalt samples will be analyzed for gross alpha, beta and gamma spectroscopy, and the listed isotopes if results deem necessary.
NA = Not applicable
TBD = To be determined in the field

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TABLE 5-27-1

SCREENING AND ANALYSIS FOR OU 1114 PHASE I SAMPLING PLAN SUMMARY OF SWMUs 3-004 (c, d) DUMPSTER AREAS BEHIND THE CMR BUILDING

SAMPLE DESCRIPTION					QC SAMPLES[2]				FIELD SCREEN		FIELD LAB	LABORATORY ANALYSIS			
												Radionuclides	Organics		Metals
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in)	TOTAL No. of SAMPLES	SAMPLE ID. NUMBER	Trip blank	Field blank	Field duplicate	Rinsate blank	Radiation screening[3]	Organic vapor screening (PID/FID)	Rad van analysis[4]	Iso-Pu, iso-U, iso-Cs[5]	VOCs (SW 8240)[5]	SVOCs (SW 8270)	Appendix VIII metals (SW6010, 7000)
SWMU 3-004(c)															
Dumpster area transects	8	Asphalt	8						8	8	8			8	8
		0-6	8						8	8	8			8	8
		s1[1]	8						8	8	8			8	8
Drainage area	1	Asphalt	1						1	1	1			1	1
		0-6	1						1	1	1			1	1
		s1	1						1	1	1			1	1
SWMU 3-004(d)															
Dumpster area transects	8	0-6	8						8	8	8			8	8
		s1	8						8	8	8			8	8
Drainage area	2	0-6	2						2	2	2			2	2
		s1	2						2	2	2			2	2
QC samples					3	3	3	3							
Confirmatory samples												4	2		
TOTALS	19		47		3	3	3	3	47	47	47	4	2	47	47

[1] s1 = soil/tuff interface (6 in. interval above interface)
[2] QC samples are based on estimated number of days in the field and total number of samples collected. This number may vary based on actual field conditions
[3] Gross alpha, beta, and gamma using field instrumentation
[4] Gross alpha, beta, and gamma using mobile laboratory instrumentation
[5] Represents minimum number of confirmation samples to be submitted for VOCs and radiological constituents (isotopic plutonium, isotopic uranium, and isotopic cesium) based on field screening results. Actual number may vary

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Harry, Please run table together. There are unnecessary breaks.

These changes were not made by Lynda Tobojinski + Melissa Jackson checked this table

Au: Please check to make sure that I haven't introduced errors. I changed some descriptions to more closely match text. MB

TABLE 6-11

PRSs PROPOSED FOR NO FURTHER ACTION OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
NO	3-001(d)	TA-3-170	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(f)	TA-3-038	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(g)	TA-3-473	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(h)	TA-3-066	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(j)	TA-3-034	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(l)	TA-3-316	Storage area	6.4.1.3	1	Not RCRA hazardous wastes/substances
NO	3-001(n)	TA-3-032	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(o)	TA-3-035	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(q)	TA-3-043	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(s)	TA-3-494	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(t)	TA-3-502	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(u)	TA-3-1485 TA-60-19	Satellite accumulation	6.4.1.4	1	Not RCRA hazardous wastes/substances
NO	3-001(v)	TA-3-1486 TA-60-29	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(w)	TA-3-1888	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(x)	TA-3-022	Satellite accumulation	6.4.3.5	3	Approved accumulation area
NO	3-001(y)	TA-3-029	Satellite accumulation	6.4.3.5	3	Approved accumulation area
YES	3-002(a)	TA-3-066	Satellite accumulation	6.4.3.5	3	Approved accumulation area
YES	3-002(d)	TA-3-040	Drum storage	6.4.2.3	2	No release to environment
NO	3-003(d)	TA-3-141	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority

1c

TABLE 6-11 (CONTINUED)

PRSs PROPOSED FOR NO FURTHER ACTION OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
NO	3-003(e)	TA-3-029	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(f)	TA-3-066	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(g)	TA-3-035	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(h)	TA-3-039	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(i)	TA-3-032	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(j)	TA-3-040	PCB-containing capacitors, transformers, drums	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(k)	TA-3-316	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(l)	TA-3-016	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(m)	TA-3-022	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority

TABLE 6-11 (CONTINUED)

PRSs PROPOSED FOR NO FURTHER ACTION OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
NO	3-003(o)	TA-3-287	PCB-containing capacitors and transformers	6.4.3.3	3	Regulated or closed under different authority
NO	3-003(p)	TA-3-142	Storage of elecrical capacitors and transformers	6.4.4.3	4	Voluntary Corrective Action
NO	3-004(a)	TA-3-029	Drum storage/ temporary	6.4.1.2	1	Not RCRA hazardous wastes/substances
NO	3-004(b)	TA-3-029	Drum storage	6.4.1.2	1	Not RCRA hazardous wastes/substances
NO	3-004(e)	TA-3-029	Satellite accumulation	6.4.1.2	1	Not RCRA hazardous wastes/substances
NO	3-004(f)	TA-3-029	Satellite accumulation	6.4.1.2	1	Not RCRA hazardous wastes/substances
NO	3-005		Renumbered; addressed in 1993 RFI Work Plan	6.4.1.4	1	Not RCRA hazardous wastes/substances
NO	3-006(a)	TA-3-012	HE-associated	6.4.1.4	1	Not RCRA hazardous wastes/substances
NO	3-008(a)	Old TA-3	HE-associated	6.4.1.3	1	Not RCRA hazardous wastes/substances
NO	3-008(b)	TA-3-43	HE-associated	6.4.2.5	2	No release to environment
YES	3-009(i)	TA-3-170	Debris pile	6.4.1.1	1	Not RCRA hazardous wastes/substances
YES	3-009(j)	TA-3-142	Debris pile	6.4.1.1	1	Not RCRA hazardous wastes/substances
YES	3-011	TA-3-031 TA-3-101	~~Outfall~~ [illegible]	6.4.1.1	1	Not RCRA hazardous wastes/substances
NO	3-016(a)	TA-3-1~~38~~ TA-3-1484	Septic tank & seepage pit	6.4.1.1	1	Not RCRA hazardous wastes/substances
NO	3-016(b)	TA-3-272	Septic tank	6.4.1.1	1	Not RCRA hazardous wastes/substances
NO	3-016(c)	TA-3-079	Septic tank	6.4.1.1	1	Not RCRA or hazardous wastes/substances
NO	3-016(d)	TA-3-443 [illegible]	Septic pit	6.4.1.1	1	Not RCRA hazardous wastes/substances

NO	3-016(e)	TA-3-1639	Lift station	6.4.1.4	1	Not RCRA hazardous wastes/substances
NO	3-016(f)	TA-3-1617	Septic pit	6.4.1.4	1	Not RCRA hazardous wastes/substances

TABLE 6-11 (CONTINUED)

PRSs PROPOSED FOR NO FURTHER ACTION OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	—	RATIONALE
YES	3-019	TA-3-018 TA-3-015	Septic tank	6.4.1.1	1	Not RCRA hazardous wastes/substances
NO	3-022	TA-3-316	Sump	6.4.4.3	4	Voluntary Corrective Action
NO	3-023	TA-3-105 TA-3-148	Sump pit	6.4.2.4	2	No release to environment
YES	3-024	TA-3-141 TA-3-174	Pump pit	6.4.2.4	2	No release to environment
YES	3-025(a)	TA-3-034	Oil trap sump	6.4.1.3	1	Not RCRA hazardous wastes/substances
YES	3-025(b)	TA-3-102	Oil trap	6.4.2.1	2	No release to environment
NO	3-025(c)	TA-3-039	Sump	6.4.2.1	2	No release to environment
YES	3-026(b)	TA-3-132	Sump	6.4.2.4	2	No release to environment
YES	3-026(c)	TA-3-029	Sump	6.4.2.1	2	No release to environment
NO	3-027	TA-3-036	Sump/lift wells	6.4.2.5	2	No release to environment
NO	3-029	TA-3-73 TA-2-271	Asphalt waste/ oil spill	6.4.1.1.1 .5	1	Not RCRA hazardous wastes/substances
NO	3-030	TA-3-066	Temporary pit; addressed in RFI Work Plan	6.4.1.4	1	Not RCRA hazardous wastes/substances
YES	3-031	TA-3-029	Sump	6.4.5	DA	No release to environment
YES	3-032	TA-3-038	Aboveground storage tank	6.4.2.4	2	No release to environment
YES	3-034(b)	TA-3-141	Contaminated soil	6.4.2.1	2	No release to environment
	3-036(a)	TA-3-75 TA-3-76	Asphalt emulsion tank	6.4.1.1.1 .1	1	Not RCRA hazardous wastes/substances
	3-036(b)	none	Above ground storage tank	6.4.1.1.1 .7	1	Not RCRA hazardous wastes/substances
	3-036(c)	TA-3-178	Asphlat emulsion tank	6.4.1.1.1 .1	1	Not RCRA hazardous wastes/substances
	3-036(d)	TA-3-335	Asphalt emulsion tank	6.4.1.1.1 .1	1	Not RCRA hazardous wastes/substances
NO	3-036(e)		Asphalt storage tank	6.4.1.1.1 .1	1	Not RCRA hazardous wastes/substances
NO	3-036(f)	none	Aboveground storage tank	6.4.1.1.1 .2	1	Not RCRA hazardous wastes/substances
NO	3-036(g)	TA-3-022	Aboveground storage tank	6.4.3.2	3	Site regulated or closed under different authority

NO	3-036(h)	TA-3-022	Aboveground storage tank	6.4.2.4	2	No release to environment
NO	3-036(i)	TA-3-022	Aboveground storage tank	6.4.4.2	4	No threat-characterized/ remediated
NO	3-036(j)	TA-3-022	Aboveground storage tank	6.4.4.2	4	Site regulated or closed by different authority
NO	3-038(c)	TA-3-028	Industrial waste line left in place	6.4.3.4	3	Site regulated or closed by different authority
NO	3-038(d)	TA-3-034 TA-3-50	Removed industrial waste line	6.4.3.4	3	Site regulated or closed by different authority

TABLE 6-11 (CONTINUED)

PRSs PROPOSED FOR NO FURTHER ACTION OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
NO	3-038(e)	TA-3-665	Sink drains	6.4.1.1	1	Not RCRA hazardous wastes/substances
NO	3-038(f)	TA-3-2009	Industrial waste line left in place	6.4.5	DA	Active; no pathway to environment
NO	3-040(a)	TA-3-030	Photographic film	6.4.1.1	1	Not RCRA hazardous wastes/substances
NO	3-040(b)	TA-3-043	Photographic film	6.4.2.5	2	No release to environment
NO	3-041	TA-3-066	Holding tank	6.4.2.1	2	No release to environment
NO	3-043(a)	TA-3-70 TA-3-74	Storage tank	6.4.1.1.1.1	1	Non RCRA hazardous waste/substance
NO	3-043(b)	TA-3-70 TA-3-77	Storage tank	6.4.1.1.1.1	1	Non RCRA hazardous wastes/substance
YES	3-043(c)	TA-3-040 TA-3-718	Storage tank	6.4.4.2	4	No threat-characterized/ remediated
NO	3-043(d)	TA-3-70 TA-3-76	Aboveground storage tank	6.4.1.1.1.1	1	Non RCRA hazardous wastes/substances
NO	3-043(f)	TA-3-070 TA-3-178	Storage tank	6.4.1.1.1.1	1	Non RCRA hazardous wastes/substances
NO	3-043(g)	TA-3-070 TA-3-335	Storage tank	6.4.1.1.1.1	1	Non RCRA hazardous wastes/substances
NO	3-043(h)	TA-3-070 TA-3-75	Aboveground storage tank	6.4.1.1.1.1	1	Non RCRA hazardous wastes/substances
NO	3-043(i)	TA-3-040 TA-3-93	Storage tank	6.4.3.1	3	Site regulated or closed under different authority
NO	3-044(a)	TA-3-70	Storage area	6.4.1.1.1.3	1	Non RCRA hazardous wastes/substances
YES	3-045(a)	TA-3-022	Outfall	6.4.3.4	3	Site regulated or closed under different authority
YES	3-045(d)	TA-3-022	Aboveground storage tank	6.4.1.4	1	Not RCRA or hazardous wastes/substances
YES	3-045(e)	TA-3-057	Outfall	6.4.1.1	1	Not RCRA or hazardous wastes/substances
YES	3-045(f)	TA-3-223	Outfall from drain	6.4.1.1	1	Not RCRA or hazardous wastes/substances
YES	3-045(g)	TA-3-673	Outfall	6.4.1.1.1.6	1	Non RCRA hazardous wastes/substances

YES	3-045(h)	TA-3-35 ~~TA-3-[illegible]~~ TA-3-187	Outfall	6.4.1.1	1	Not RCRA or hazardous wastes/substances
YES	3-045(i)	TA-3-034	Outfall	6.4.1.1	1	Not RCRA or hazardous wastes/substances

TABLE 6-11 (CONTINUED)

PRSs PROPOSED FOR NO FURTHER ACTION OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
YES	3-046	TA-3-022	Aboveground storage tank	6.4.3.2	3	Site regulated or closed under different authority
NO	3-047(a)	TA-3-236	Storage	6.4.2.5	2	No release to environment
NO	3-047(b)	TA-3-1501	Storage	6.4.1.1.1.4	1	Non RCRA hazardous wastes/substances
NO	3-047(c)	TA-3-070	Drum storage	6.4.1.1.1.3	1	Not RCRA hazardous wastes/substances
NO	3-047(d)	TA-3-22	Storage	6.4.4.3	4	Voluntary Corrective Action
NO	3-047(e)	TA-3-1963	Storage	6.4.1.1.1.4	1	Non RCRA hazardous wastes/substances
NO	3-047(f)	TA-3-1976	Storage	6.4.1.1.1.4	1	Not RCRA hazardous wastes/substances
NO	3-047(g)	TA-3-141	Drum storage	6.4.2.3	2	No release to environment
NO	3-047(h)	TA-3-170	Waste oil leaks, spills	6.4.2.3	2	No release to environment
NO	3-047(i)	TA-3-216	Satellite accumulation	6.4.2.5	2	No release to environment
NO	3-047(j)	TA-3-016	Drum storage	6.4.2.5	2	No release to environment
NO	3-047(k)	TA-3-374	Drum storage	6.4.1.1	4	No threat-characterized/ remediated
NO	3-048	TA-3-029	Satellite accumulation	6.4.1.2	1	Not RCRA or hazardous wastes/substances
YES	3-049(c)	TA-3-066	Outfall	6.4.1.1	1	Not RCRA or hazardous wastes/substances
YES	3-049(d)	TA-3-066	Outfall	6.4.1.1	1	Not RCRA or hazardous wastes/substances
YES	3-049(e)	TA-3-066	Outfall	6.4.1.4	1	Not RCRA or hazardous wastes/substances
YES	3-050(a)	TA-3-029	Exhaust emissions	6.4.1.2	1	Not RCRA or hazardous wastes/substances
YES	3-050(b)	TA-3-034	Exhaust emissions	6.4.1.2	1	Not RCRA or hazardous wastes/substances
YES	3-050(c)	TA-3-35	Exhaust emissions	6.4.1.2	1	Not RCRA or hazardous wastes/substances
YES	3-050(d)	TA-3-102	Exhaust emissions	6.4.1.2	1	Not RCRA or hazardous wastes/substances
YES	3-050(e)	TA-3-39	Exhaust emissions	6.4.1.2	1	Not RCRA or hazardous wastes/substances
YES	3-050(f)	TA-3-40	Exhaust emissions	6.4.1.2	1	Not RCRA or hazardous wastes/substances

TABLE 6-11 (CONTINUED)

PRSs PROPOSED FOR NO FURTHER ACTION OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
YES	3-050(g)	TA-3-16	Exhaust emissions	6.4.1.2	1	Not RCRA or hazardous wastes/substances
NO	3-051(a)	TA-3-039	Oil from leaking compressor	6.4.3.3	3	Site regulated or closed by different authority
NO	3-051(b)	TA-3-102	Oil/leaking compressor	6.4.3.3	3	Site regulated or closed by different authority
YES	3-051(c)	TA-3-141	Vacuum pump leaking	6.4.4.3	4	Voluntary Corrective Action
NO	3-051(d)	TA-3-040	Oil/leaking compressor	6.4.2.5	2	No release to environment
YES	3-052(c)	TA-3-422	Storm drains	6.4.4.1	4	One-time release
NO	3-052(d)	TA-3-287	Storm drains	6.4.3.3	3	Site regulated or closed by different authority
YES	3-054(a)	TA-3-016 TA-3-019	Outfall	6.4.2.5	2	No release to environment
YES	3-054(c)	TA-3-105 TA-3-156	Outfall	6.4.3.4	3	Site regulated or closed by different authority
YES	3-054(d)	TA-3-016 TA-3-208	Outfall	6.4.2.5	2	No release to environment cvbnm
YES	3-055(a)	TA-3-016	Outfall	6.4.1.1	1	Not RCRA or hazardous wastes/substances
YES	3-055(c)	TA-3-041	Outfall	6.4.1.3	1	Not RCRA or hazardous wastes/substances
YES	3-055(d)	TA-3-059	Outfall	6.4.1.3	1	Not RCRA or hazardous wastes/substances
NO	3-056(b)	TA-3-70	Storage area	6.4.1.1.1.3	1	Non RCRA hazardous wastes/substances
YES	3-056(c)	TA-3-223	Storage area	6.4.4.3	4	Expedited Cleanup
YES	3-056(d)	TA-3-047	Drum storage	6.4.2.3	2	No release to environment
NO	3-056(e)	TA-3-34	Satellite storage	6.4.1.4	1	Not RCRA or hazardous wastes/substances
NO	3-056(f)	TA-3-316	Drum storage	6.4.1.4	1	Not RCRA or hazardous wastes/substances
NO	3-056(g)	TA-3-016	Satellite accumulation	6.4.3.5	3	Approved accumulation area

NO	3-056(h)	TA-3-105 TA-3-287	PCB-containing capacitors and transformers	6.4.3.3	4	No threat-characterized / remediated
NO	3-056(i)	TA-3-038	Drum storage	6.4.2.3	2	No release to environment
NO	3-056(j)	TA-3-473	Storage	6.4.1.1	1	Not RCRA or hazardous wastes/substances

TABLE 6-11 (CONTINUED)

PRSs PROPOSED FOR NO FURTHER ACTION OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
YES	3-056(m)	TA-3-322	Drum storage	6.4.1.1	1	Not RCRA or hazardous wastes/substances
YES	3-056(n)	TA-3-379	Drum storage	6.4.2.3	2	No release to environment
NO	3-057	TA-3-100 TA-3-688	Grease trap	6.4.1.1	1	Not RCRA or hazardous wastes/substances
NO	3-058	TA-3-029	Satellite accumulation	6.4.1.2	1	Not RCRA or hazardous wastes/substances
NO	C-3-001	TA-3-28 TA-3-1872 TA-3-1498	Gas trap manhole	6.4.1.1	1	Not RCRA or hazardous wastes/substances
NO	C-3-002	TA-3-035	Leak from asphalt machine	6.4.4.1	4	One-time release
NO	C-3-003	TA-3-039	Stained asphalt	6.4.4.1	4	One-time release
NO	C-3-004	TA-3-066	Misc. debris	6.4.1.1	1	Not RCRA or hazardous wastes/substances
NO	C-3-005	TA-3-073	Storm drains	6.4.1.1.1.6	1	Non RCRA hazardous wastes/substances
NO	C-3-007	TA-3-035	Storage	6.4.1.2	1	Not RCRA or hazardous wastes/substances
NO	C-3-008	TA-3-164	Storage/rad contaminated	6.4.1.2	1	Not RCRA or hazardous wastes/substances
NO	C-3-009	TA-3-169	Storage	6.4.2.5	2	No release to environment
NO	C-3-010	TA-3-019	Outfall	6.4.2.5	2	No release to environment
NO	C-3-011	TA-3-070	Storage tank	6.4.1.1.1.2	1	Non RCRA hazardous wastes/substances
NO	C-3-012	TA-3-029	Satellite accumulation	6.4.2.5	1	Not RCRA or hazardous wastes/substances
NO	C-3-015	TA-3-036	Underground storage tank	6.4.3.1	3	Site regulated or closed under different authority
	C-3-016		Oil metal bin	6.4.1.1.1.7	1	Non RCRA hazardous wastes/substances
NO	C-3-017	TA-3-028	Underground storage tank	6.4.3.1	3	Site regulated or closed under different authority
NO	C-3-018	~~TA-3-028~~ TA-3-157	Underground storage tank	6.4.2.4	2	No release to environment
NO	C-3-019	TA-3-016	Underground storage tank	6.4.1.3	1	Not RCRA or hazardous wastes/substances

NO	C-3-021	TA-3-016 TA-3-191	Underground storage tank	6.4.3.1	3	Site regulated or closed under different authority

TABLE 6-11 (CONTINUED)

PRSs PROPOSED FOR NO FURTHER ACTION OR DEFERRED ACTION IN CHAPTER 6, ADDENDUM 1

HSWA LISTED	PRS	LOCATION	DESCRIPTION	SUB-SECTION	[illegible]	RATIONALE
NO	C-3-022	TA-3-070	Kerosene tanker trailer	6.4.1.1.1.1	1	Non RCRA hazardous wastes/substances
NO	C-59-001	TA-59-184	PCB-containing capacitors and transformers	6.4.3.3	3	Site regulated or closed under different authority
NO	C-3-020	TA-3-105	Storage tanks	6.4.3.1	3	Site regulated or closed under different authority
NO	C-60-001	TA-60-1 TA-3-382	Storage tank	6.4.3.1	3	Site regulated or closed under different authority
NO	C-60-002	TA-60-45	Storage tank	6.4.3.1	3	Site regulated or closed under different authority
NO	C-60-003	TA-60-29	One-time release at pest shed	6.4.4.1	4	No threat-characterized remediated
NO	C-60-004	TA-60-1	Storage tank	6.4.1.4	1	Not RCRA or hazardous wastes/substances
NO	C-61-001	TA-61-23	PCB oil leak	6.4.1.4	1	Not RCRA or hazardous wastes/substances

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List of Contributors

Addendum 1

LIST OF CONTRIBUTORS

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35?

NAME AND AFFILIATION	EDUCATION/EXPERTISE	ER PROGRAM ASSIGNMENT
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Appendix D

Field Investigation Approach and Methods

RFI Work Plan (1993)

- General
- Field Operations
- Standard Screening Methods
- Field Surveys and Screening
- Field Analysis
- Laboratory Analyses
- Sampling Methods

Addendum 1

- Introduction
- General Field Operations
- Standard Screening Methods
- Field Surveys and Screening
- Field Analyses
- Laboratory Analyses
- Sampling Methods

Cop. to author T. Johnston cc: 6-6-95.

Tom Johnston comments in red - complete cy attached.

1.0 INTRODUCTION

This appendix limits the repetition of information related to field investigations by describing elements that are common to ~~such~~ field investigations at all Operable Unit (OU) 1114 potential release sites (PRSs). Those elements include:

- releases of radioactive materials without simultaneous release of hazardous constituents;
- the release of hazardous constituents at some PRSs may not have been associated with the release of radioactive materials, but human activities and action by physical forces would have diluted this isolation effect;
- the potential use of field surveys and field screening to identify gross contamination and assist in sample selection for laboratory analyses;
- the potential use of field laboratory analyses to guide field operations; and,
- the use of analytical laboratory analyses to complete the sampling/analyses planned at each phase of site investigation.

No equivalent subsection in the '94 IWP.

The primary focus of this appendix is on field investigation methods. It is based on the field sampling methods section of the Laboratory's Installation Work Plan (IWP). Subsection 4.4 (LANL 1993, 1017). The methods described (see Sections 4.0 to 7.0) include:

Section 3 in Technical Approach in the new IWP. However, it is not as detailed re. field sampling methods. Would it be OK to leave phrase as is?

- field survey methods to identify contaminants *in situ* and field sample screening methods to be used at the point of sample collection;
- field analytical methods;
- analytical laboratory methods; and,
- sampling methods.

This appendix also identifies several aspects of the Laboratory's implementation of the field sampling process that are not mentioned in the PRS-specific field sampling plans. Standard activities that will be used to support field operations (see Section 2.0, General Field Operations) include:

- laboratory-required preliminary activities and support procedures;
- identification and documentation of locations that have been sampled;
- sample handling and laboratory coordination procedures;
- equipment decontamination procedures; and,
- management of wastes generated by sampling activities.

Specific information such as sampling locations or target depths of boreholes is provided by the individual field sampling plan. The method descriptions presented here are intended to complement the site-specific Quality Assurance Project Plan (QAPjP), Annex II, ~~of Addendum 1~~ and the governing standard operating procedures (SOPs).

Where reference is made to work conducted in accordance with particular procedures, it is understood that the most current revision of the procedures will be used.

2.0 GENERAL FIELD OPERATIONS

Activities not associated with physical, radiological, or chemical analyses of environmental samples are described in this section.

2.1 Archaeological, Cultural, and Ecological Evaluations

Prior to initiating fieldwork and as part of the Laboratory's environment, safety, and health (ES&H) questionnaire process, archaeological and ecological evaluations shall be performed in all areas where the surface is to be disturbed, vegetation is to be removed, or invasive sampling is to be performed. Depending on the results of the archaeological and ecological

evaluations, a Department of Energy (DOE) environmental checklist for either categorical exclusion or environmental assessment will be completed.

2.2 Excavation Permits

As part of the ES&H questionnaire process, excavation permits are required by the Laboratory prior to any excavation, drilling, or other invasive activity. Acquisition of the permits will be coordinated with the Laboratory's ~~Safety and~~ Risk ~~Assessment~~ Group (~~HS-3~~) and Johnson Controls World Services, Inc. Acquisition of excavation permits must be scheduled as appropriate for each phase of fieldwork. All areas intended for excavation, drilling, or sampling deeper than 18 in. must be marked in the field for formal clearance prior to the work.

2.3 Health and Safety

Annex III of the RFI Work Plan for OU 1114 presents the Health and Safety Project Plan for all field activities within OU 1114 (LANL 1993, 1090). The plan presents PRS-specific information regarding known or suspected contaminants and the personal protection required for performing various field activities. Samples acquired as part of this work plan shall be screened at the point of collection to identify the presence of gross contamination or conditions that may pose a threat to the health and safety of field personnel. The field screening techniques listed in Subsection 4.2 of this appendix will be used.

2.4 Support Services

Physical ~~support services during the~~ field investigation ~~will be provided by~~ the Laboratory ~~Design~~ Group (~~FSS-6~~), ~~Field~~ Operations Group (~~FSS-9~~), Johnson Controls, or other contractors/subcontractors. Existing job ticket procedures will be used. The services these groups will provide include, but are not limited to: excavating using backhoes and front-end loaders, moving pallets of drummed auger cuttings and decontamination solutions, and setting up signs and other warning notices around the perimeter of work areas.

2.5 Environmental and QC Sample Coordination

The Sample Coordination Facility (SCF) has been established by the Environmental Restoration (ER) Project to provide consistency for all investigations with regard to sample handling and tracking. The SCF is to be notified at least 30 days prior to implementing the sampling operation. The notification will serve to alert the SCF to the numbers and types of environmental samples and quality control (QC) samples to be collected and shipped. With the assistance of the SCF the numbers and types of sample bottles required to support the field effort, and the laboratories to which the samples will be shipped, can be determined. SOPs governing field quality control samples and environmental ~~sample collection~~ identification, shipping, etc. are identified in the ~~LANL ER Project~~ Quality Assurance Project Plan (QAPP), Chapter 4 in the Int (LANL ~~1991, 0553~~) and Subsection 2.9 of Appendix ~~D.~~ The Records Processing Facility (RPF) or a well maintained set of controlled procedures should also be consulted to identify changes to existing procedures or additional procedures that govern sampling operations.

- Descriptions of ~~the use and intended purpose~~ of each kind of QC sample ~~are~~ is provided in the ~~LANL ER Project QAPP~~ (LANL ~~1991, 0553~~). The frequency with which each type of field QA sample is to be collected is detailed in the sampling plans in Chapter 5 of Addendum 1.

2.6 Site Control

Access, staging, and sample storage areas will be designated by the field team leader (FTL). To maintain sample integrity and adequate sample documentation, all sampling sites will be included in one or several exclusion zones. Exclusion zones will be delineated by the FTL with the concurrence of the site safety officer (SSO). The boundary of an exclusion zone will be defined based on the nature, magnitude, and extent of confirmed or possible contamination; the potential for contaminant migration; hazards at the site, for example, use of mechanical equipment; the presence of electrical lines or other utilities, structures, tanks, pits, or trenches; and the presence of steep banks or cliffs.

Boundaries of exclusion zones may be changed as operations progress. All changes shall be designated by the FTL or designee with the concurrence of the SSO.

2.7 Site Monitoring

The OU 1114 Health and Safety Plan details procedures required to ensure the health and safety of field personnel during fieldwork (LANL 1993, 1090). Entry into and egress from sites will be controlled for monitoring purposes. All personnel entering the sites must use appropriate radiation monitoring badges, i.e., thermoluminescent dosimeters (TLDs), and other monitoring devices as specified by the SSO. Locations for drinking water, restroom facilities, etc., will be identified by the SSO prior to the start of site activities. Protective clothing requirements will be determined by the SSO assigned to the project.

Field measurements for wind-borne contaminants shall be made and documented prior to, during, and after surface sampling activities. Qualified health and safety personnel (or designees) are responsible for this monitoring. Results of monitoring will be used to evaluate possible existing hazards at the site in order to ascertain current conditions and specify personal protective equipment. All personnel are required to visually monitor for extreme weather conditions, lightning, or other physical or environmental hazards that may develop. Personnel are required to notify the SSO when unanticipated physical or environmental hazards develop. Potential site hazards are discussed in detail in Annex III of the RFI Work Plan for OU 1114 (LANL 1993, 1090).

2.8 Contamination Control

To ensure sample integrity, to maintain control over sampling waste, and to avoid contamination of the site office, decontamination may be required for personnel, equipment, and vehicles moving from one zone to another. Therefore, a contamination reduction zone (CRZ) surrounding the exclusion zone(s) shall be established. A contamination reduction corridor, the size of which will depend on the number of stations required for decontamination

activities shall be established through the CRZs. The corridor should be located in a direction that is generally upwind from the exclusion zone.

If required, decontamination stations will be set up to reduce contamination as personnel move toward the end of the contamination reduction corridor. The system shall ensure that all sample containers, waste containers, protective equipment, tools, and other equipment are washed and rinsed at least once. A sequential doffing of protective equipment shall be conducted, starting with the most heavily contaminated items at the first station and progressing to the least contaminated items at the final station. The stations shall be far enough apart to minimize cross-contamination. The spacing will be based on best professional judgment of the FTL.

Decontamination and waste management shall be controlled through proper implementation of the site-specific OU 1114 Waste Management Plan. All decontamination materials must be stored in drums with proper labels and identifying information. Efforts shall be made to keep the volume of decontamination materials to a minimum. Persons involved in performing the actual decontamination will generally be dressed in protective clothing one level below what the exclusion zone workers are required to wear. Prior to leaving an exclusion zone or central decontamination area, all personnel and equipment shall be monitored by a radiation control technician for radioactive contamination. The choice of monitoring technique is to be decided by the FTL (or FTL designee) and the SSO.

Personnel entering an exclusion zone in which personnel decontamination is required must follow the specified decontamination procedures. Personnel who are not required to wear the maximum level of protective clothing may bypass the decontamination stations for protective clothing that they are not wearing.

2.9 Sample Control and Documentation

Sample packaging, handling, chain-of-custody, documentation, and shipping procedures are provided in the following ER Project SOPs.

- LANL-ER-SOP-01.01, R0, General Instructions for Field Investigations;

- LANL-ER-SOP-01.02, R0, Sample Containers and Preservation;
- LANL-ER-SOP-01.03, R1, Handling, Packaging, and Shipping of Samples; and,
- LANL-ER-SOP-01.04, R2, Sample Control and Field Documentation.

2.10 Equipment Decontamination

Decontamination is performed as a quality assurance measure and a safety precaution. All equipment decontamination practices shall conform to the requirements of the approved site-specific waste management plan. Decontamination prevents cross-contamination among samples and helps maintain a clean working environment for the safety of personnel. Sampling tools are decontaminated by washing, rinsing, and drying. Disposable sample collection devices will be used as deemed necessary to eliminate costly decontamination procedures in the field. The effectiveness of the decontamination process is documented through rinsate blanks submitted for laboratory analysis. Steam cleaning is used for large machinery, vehicles, auger flights, and coring tools used in borehole sampling. Decontamination fluids, including steam-cleaning fluids, are considered wastes and must be collected and contained for proper disposal.

2.11 Waste Management

Wastes produced during sampling activities may include borehole auger cuttings, excess samples, excavated soil from trenching, decontamination and steam-cleaning fluids, and disposable materials such as wipes, protective clothing, and sample bottles. Hazardous waste, low-level radioactive waste, transuranic waste, and mixed waste (either low-level or transuranic) may be encountered in OU 1114. Requirements for segregating, containing, characterizing, treating, and disposing of each type and category of waste are provided in an administrative procedure (AP), LANL-ER-AP-05.3, R0, Management of Environmental Restoration Program Waste.

3.0 STANDARD SCREENING METHODS

In all sampling plans ~~of this~~ Addendum 1, a ~~Screening and Analysis~~ table has been used to identify certain field operations ~~as well as~~ (requirements for) sampling and analysis requirements. The use of such tables is described below using ~~Table D-1~~ as an example. Methods have ~~been selected~~ in accordance with requirements delineated in the ~~LANL EH Project~~ (SWP) Quality Assurance Project Plan. (LANL 1995, 1164)

3.1 Samples and Sampling Methods

The two columns on the left side of Table D-1 identify ~~by PRS~~ the sampling location ~~or type and~~ description and the number of sample locations. The next ~~six~~ columns identify the following: depth interval (as appropriate), total number of samples to be taken, and space for recording each sample identification number, and the types and number of quality assurance (QA)/QC samples to be analyzed. The sampling methods or activities identified in the first column are specifically defined below. Sampling methods are described in detail in Section 7.0 of this appendix.

Below the sampling location and description are

3.1.1 Use of the Standard Screening and Analysis Tables

The screening and analysis tables serve two major purposes. First, they clearly and concisely summarize the details of a sampling plan. They:

- identify sampling locations,
- indicate sampling methods and spatial sampling intervals,
- identify the screening and analysis measurements for each sample detailed in Chapter 5 of Addendum 1,
- explicitly identify the collection and analysis of field quality assurance samples, and
- give a representation of certain options and uncertainties in the plan.

The tables also provide the detail needed to estimate costs associated with the investigation.

D-1

TABLE 6-12-1

EXAMPLE OF ANALYTICAL REQUIREMENTS

SCREENING AND ANALYSIS FOR OU 1114

A ~~PHASE I~~ SAMPLING PLAN SUMMARY OF

SWMU 3-054(e) and C-3-006,

MORTANDAD CANYON OUTFALL

SAMPLE DESCRIPTION					FIELD SCREEN			LABORATORY ANALYSIS				
								Radio nuc. Isot.	Organics			Metal
SAMPLING LOCATION DESCRIPTION	No. of SAMPLE LOCATIONS	SAMPLE DEPTH (in)	TOTAL No. of SAMPLES	SAMPLE ID. NUMBER	Radiation screening[a,b]	Organic vapor screening (PID/FID)	Rad van analysis[a,b]	ISO-Pu, ISO-U, gamma spec., tritium	VOCs (SW 8240)	PCBs (SW 8080)	SVOCs (SW 8270)	Appendix VIII metals (SW 6010, 7000)
Mortandad Canyon												
Depositional area 1	2	0-12	2		2	2	2	2		2	2	2
		s/s[c]	2		2	2	2	2		2	2	2
Depositional area 2	2	0-12	2		2	2	2	2		2	2	2
		s/s[c]	2		2	2	2	2		2	2	2
Depositional area 3	2	0-12	2		2	2	2	2		2	2	2
		s/s[c]	2		2	2	2	2		2	2	2
QC samples[d]												
Field duplicate	1	TBD[e]	1		1	1	1	1	1		1	1
Field collocated	1	TBD	1		1	1	1	1	1		1	1
Rinsate blank	NA[f]	NA	1					1			1	1
Confirmatory samples	2	TBD	2		2	2	2		2[g]			
TOTALS	10		17		16	16	16	15	4	12	15	15

[a] Gross alpha, beta, and gamma using field instrumentation.

[b] Gross alpha, beta, and gamma using mobile laboratory instrumentation.

[c] s/s = soil/tuff interface (12-in. interval above interface)

[d] QC samples are determined using guidelines outlined in the site specific QAPP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.

[e] TBD = To be determined in the field

[f] NA = Not applicable

[g] Represents minimum number of confirmatory samples to be submitted for VOCs based on field screening results. Actual number may vary.

TABLE D-1

EXAMPLE OF SCREENING AND ANALYTICAL REQUIREMENTS FOR A SAMPLING PLAN

SCREENING AND ANALYSIS FOR OU 1114

(revised March 1994)

PHASE I SAMPLING PLAN SUMMARY OF SIGMA MESA SOLAR POND

SAMPLING LOCATION/TYPE	SAMPLE LOCATION DESCRIPTION	SAMPLE DESCRIPTION: Sample depth (inches)	Sample I.D. number	Field duplicate	Field split	Collocated sample	Total samples	FIELD SCREEN: Radiation screen[1]	Organic vapor screen	FIELD LABORATORY: Rad van analysis[2]	Rad van tritium	GC/FID for TPH (SW 8015)	Immunoassay kit for PCBs (SW 4020)	LABORATORY ANALYSIS: Radionuclides: Gross alpha/beta/gamma	Isotopic analyses[3]	Tritium	Organics: Herbicides (SW 8150)	Organochlorine pesticides (SW 8080)	Organophosphorous pesticides (SW 8140)	PCBs (SW 8080)	SVOCs (SW 8270)	TPH (SW 8015)	VOCs (SW 8240)	Metals: Appendix VIII metals (SW 6010, 7000)	Misc: Cyanide (SW 9010, 9012)
SWMU 60-004(c)	Temporary drum storage																								
Manual shallow core	Stained soil	0-12					1	1	1	1	1			1	•	•				1	1				
		12-18					1	1	1	1	1			1	•	•							1		
Manual shallow core	Stained soil	0-12				1	2	2	2	2	2			2	•	•				2	2				
		12-18		1			2	2	2	2	2			2	•	•							2		
Manual shallow core	25 ft south of gate	0-12					1	1	1	1	1			1	•	•				1	1				
		12-18					1	1	1	1	1			1	•	•							1		
Manual shallow core	50 ft south of gate	0-12					1	1	1	1	1			1	•	•				1	1				
		12-18					1																		
SWMU 60-005(a)	Solar Pond																								
Liner removal	Hypalon liner	N/A					1	1	1	1															
Manual shallow core	Pond bottom (above gravel)	0-12			1		2	2	2	2	1			2	•	•					2			2	
		12-18			1		2	2	2	2	1			2	•	•					1		2	2	2
Manual shallow core	Pond bottom (above gravel)	0-12					1	1	1	1	1			1	•	•					1			1	
		12-18					1	1	1	1	1			1	•	•					1		1	1	1
Manual shallow core	Pond bottom (above gravel)	0-12					1	1	1	1	1			1	•	•					1			1	
		12-18					1	1	1	1	1			1	•	•					1		1	1	1
Manual shallow core	Pond bottom (below gravel)	0-12					1	1	1	1	1			1	•	•					1			1	
Manual shallow core	Pond bottom (below gravel)	0-12					1	1	1	1	1			1	•	•					1			1	
Manual shallow core	Pond bottom (below gravel)	0-12					1	1	1	1	1			1	•	•					1			1	
TOTAL NUMBER OF SAMPLES				1	2	1	21	21	21	21	18			20	20	20				5	15		9	11	4

s/i = soil/sil interface
SCB = sediment catchment basin

[1] • Analyses will only be conducted if field screening indicates elevated levels
[1] Gross alpha, beta, and gamma using field instrumentation
[2] Gross alpha, beta, and gamma using mobile laboratory instrumentation
[3] Specific isotopic analyses described in the text

3.2 Screening, Surveying, and Analysis Methods

Very precise language, as described below, has been adopted in Addendum 1 to refer to categories of measurements. Table D-2 summarizes instrumentation and methods to be used or designated analytical approaches.

1. **Field Surveys** (or surveys). Direct reading or recording instruments are used to scan the land surface to make measurements of *in situ* conditions. Commonly, surveys provide data of lesser precision than more definitive test methods but they can provide results very quickly. The minimal sample preparation involved generally limits surveys to collecting information related to visual observation and surficial contamination, or to contaminants emitting high energy radiation that can pass through the sample matrix to the detector. It also limits radiological and chemical information to gross categories rather than the identification and quantitation of specific contaminants. Gamma radioactivity is a common target of field surveys. Land surveys and borehole logging are also included in this category.

2. **Field Screening** (field sample screening or screening). This is the process by which instruments or observations are applied to samples at the point of collection to measure the presence of contaminants or to determine other properties of the sample. The quality of data provided by screening and the associated level of data review is comparable to survey data, but the ability to identify and quantify specific contaminants or more focused groups of contaminants is improved in some cases. Gross radioactivity (beta/gamma) and organic vapors are common targets of field screening. Lithologic logging of core samples is included in this category.

TABLE D-2
INSTRUMENTATION AND METHODS FOR PROPOSED ANALYTICAL LEVELS

FIELD SURVEY AND SCREENING
Portable instruments:
Phoswich meter
FIDLER meter (Field instrument for the detection of low-energy radiation)
Geiger-Mueller counter ESP-1 beta/gamma meter ESP-1 alpha meter
MicroR meter
Organic vapor analyzer (OVA)
Photoionization detector
Explosimeter
Oxygen level indicator
Field test/methods/kits:
OVA headspace test
HNU headspace test
Ensys™ PCB immunoassay kits
FIELD ANALYSIS INSTRUMENTATION
Radiological screening laboratory
Field gas chromatography (GC)/flame ionization detector (FID)
X-ray fluorescence
LABORATORY ANALYSIS INSTRUMENTATION
EPA protocol for soil, air, and water analysis for semivolatile organic compounds and metals using Los Alamos, off-site, or mobile laboratories typically includes the following instrumentation (EPA 1992, 1207) 1994, 1222
Gas chromatography (GC)
Gas chromatography/mass spectrometry (GC/MS)
Inductively coupled plasma-atomic emission spectroscopy (ICAP) (ICP-AES)
Atomic absorption (AA)

Au: Source is the Grow-Hill Dictionary of Scientific and Technical Terms OK

Move to p D-10

By averaging data from replicate screens, precision comparable to laboratory analyses may be obtained.

3. **Field Analysis** (or field laboratory analysis). This category represents the initial analyses conducted on samples in the field prior to selecting samples for submission to the analytical laboratory. These analyses are conducted to provide information to direct voluntary corrective actions (VCAs) or to direct which samples are submitted for further analysis at the analytical laboratory. Sample preparation is more rigorous than that used for screening analyses, but not as rigorous as that used for laboratory analyses. This allows for collecting information beyond that which can be collected by screening or surveys alone. Field analyses may provide a quality of data that is more stringent than screening or survey data. The level of data review is generally more detailed than the reviews imposed on screening data. Analyses conducted in field radiological trailers and with the field gas chromatography (GC)/flame ionization detector (FID) are included in this category.

4. **Laboratory Analysis** (or analytical laboratory analyses). This category represents the primary analysis for which samples are collected. Because the data are generated in a highly controlled environment, the opportunity for generating data of incontestable quality is generally considered to be greater than screening, survey, or field analytical data. Of all data types, the level of quality control and data scrutiny is typically greatest for laboratory analyses. Such analyses are commonly provided by off-site analytical laboratories but may be provided by Los Alamos National Laboratory (LANL) analytical groups, especially in the case of highly radioactive samples and samples requiring very rapid turnaround.

For each of the sampling categories in Table D-1, several measurement techniques are identified by vertical columns. The individual measurement techniques represented by each vertical column are identified in the following sections of this appendix: Section 4.0, Field Surveys and Screening; Section 5.0, Field Analyses; and Section 6.0, Laboratory Analyses.

4.0 FIELD SURVEYS AND SCREENING

Field surveys are primarily walking scans of the land surface using direct reading or recording instruments. Field survey data and screening data, for example, radioactivity or organic vapor measurements, are used to identify the presence of contaminants or structures in the field. While negative results from field surveys are not conclusive evidence of PCOCs below trigger levels, positive results obtained at an early stage can allow timely redirection of a sampling plan. For convenience, land surveys to identify and mark locations from old drawings are included in this category.

4.1 Field Surveys

4.1.1 Radiological Surveys

Radiological surveys are conducted to identify the presence of radioactive contamination at a site. Several instruments are suitable for these surveys: microR meters, sodium iodide (NaI) detectors of various sizes with ratemeters and scalers, ~~Geiger-Mueller detectors (such as the ESP-1~~ beta/gamma meters), FIDLER, and Phoswich. The specific uses of each meter are discussed in the following subsections.

4.1.1.1 Gross Gamma Surveys

Several instruments are suitable for gross gamma surveys, including microR meters, NaI detectors of various sizes with ratemeters or scalers, and Geiger-Mueller detectors. The preferred instruments are microR meters with the ability to measure to 5 μR/hr, 2-in.-by-2-in. NaI detectors with a ratemeter capable of displaying 100 counts per minute (cpm), and the ESP-1 beta/gamma meter. Some discrete- or continuous-measurement recording instruments are also available using the same detectors. Surveys are conducted by carrying the instrument at waist height, walking at a slow pace, and observing and recording the ratemeter response. Measurements may also be made at the ground surface to aid in verifying the presence of localized radioactive contamination.

4.1.1.2 Low-Energy Gamma Surveys

Either the FIDLER or the Phoswich detector may be used for ~~Addendum-1.~~ low-energy gamma surveys. Both are optimized for the detection of low-energy gamma photons, such as the 60 keV gamma emission from americium-241 or x-rays that accompany the decay of heavy radionuclides such as uranium, thorium, plutonium, and other transuranic radionuclides. Discrete or continuous-measurement recording options are available. Surveys are conducted by carrying the instrument close to (i.e., within 12 inches of) the ground surface and observing the ratemeter or scaler. Measurements may also be made at the ground surface to aid in verifying the presence of localized contamination.

4.1.2 Organic Vapor Surveys

Organic vapor detectors will be used to monitor breathing zones for personnel safety in sample collection and handling areas at OU 1114 sites. Two types of detectors, a photoionization detector (PID) and a flame ionization detector (FID), will be used to survey a wide range of organic vapors as described below.

4.1.2.1 Photoionization Detectors (PIDs)

A Model PI 101 PID or its equivalent will be used. This is a general survey instrument capable of detecting real-time concentrations of many complex organic compounds and some inorganic compounds in air. The instrument can be calibrated to a particular compound; however, it cannot distinguish among detectable compounds in a mixture of detectable gases.

4.1.2.2 Flame Ionization Detectors (FIDs)

A Foxboro Model OVA-128 FID or its equivalent will be used. An FID can be used as a general screening instrument to detect the presence of many organic vapors. Its response to an unknown sample is relative to the response ~~of~~ to a gas of known composition to which the instrument has been calibrated. Its quantitative usefulness is, therefore, limited by the comparability of the sample gas to the calibration gas.

4.1.3 Combustible Gas/Oxygen Detector

A Gastech Model 1314 or its equivalent will be used to determine the potential for combustion or explosion of unknown atmospheres during drilling and intrusive activities. A typical combustible gas indicator (CGI) determines the level of organic vapors and gases present in an atmosphere as a percentage of the lower explosive limit or lower flammability limit. The Gastech Model 1314 also contains an oxygen detector to identify atmospheres that are deficient or enriched in oxygen. For health and safety purposes, the CGI will be used (if appropriate) to monitor atmospheres during some intrusive activities.

4.1.4 Land Surveys

Land surveys will be used both to document all sampling locations and, if needed, to locate either former or buried structures. In all cases, the documentation requirements for the surveys are plus or minus 1 ft horizontal and plus or minus 0.1 ft vertical. The survey procedure used is LANL-ER-SOP-03.01, R1, Land Surveying Procedures.

4.1.5 Geomorphic Mapping

Field or geomorphic mapping is required for OU 1114 to assist in the location of certain sampling points. In order to sample drainages judged most likely to contain potential contamination, some of the individual sampling plans in Chapter 5 require the identification of watercourses or drainages. Preliminary fieldwork at OU 1114 indicates that an expert field geologist is required to map current-day precipitation runoff channels. The geologist will correlate current-day drainage channels to the historic channels that would have carried effluent from OU 1114 outfall locations into the lower gradient area at the floor of the canyon. To assist in correlating current drainage channels to historic drainage channels, the geologist will use field mapping, aerial photographs, topographic maps, and other archival information. The LANL ER Project QAPP contains requirements concerning the use of archived data (LANL-1991, -0593).

Several PRS aggregate drainages and channels are well defined from the rim to the floor of the canyon. Other aggregates will require mapping as described above. Professional judgment allows placing representative

sampling locations or establishing placement of a systematic sampling grid on field maps. Representative sampling locations must provide adequate coverage to assess dissemination of potential contaminants in the drainages. Correct use of well-documented judgmental sampling points will allow less reliance on nonjudgmental or random sampling regimens.

4.2 Field Screening

Screening measurements are applied at the point of sample collection, in borehole headspace, and in excavations to identify gross contamination and to assess conditions affecting the health or safety of field personnel. Application of screening for personnel health and safety is detailed in Annex III of this work plan and the Health and Safety Program Plan, Annex III in the IWP (LANL 1993, 1090; 1993, 1013). Individual sampling plans may not explicitly identify the use or role of sample screening measurements; however, the standard analytical table for each investigation shall show the methods to be used.

4.2.1 Radiological Screening

Radiological screening is conducted to identify the presence of gross radioactive contamination of samples and personnel. Several instruments are suitable for these surveys including microR meters, NaI detectors of various sizes with ratemeters and scalers, Geiger-Mueller detectors, and alpha scintillation detectors. The specific uses of each meter are discussed in the following subsections.

4.2.1.1 Gross-Gamma Radiological Screening

Field screening of samples for gross-gamma radioactivity will be done using a hand-held NaI detector probe and ratemeter or the ESP-1 beta/gamma meter. The NaI detector is held close to the sample or core and is capable of identifying elevated concentrations of certain radionuclides as an increased reading above instrument background levels. The response is best interpreted as a gross indicator of potential contamination.

4.2.1.2 Gross-Alpha Radiological Screening

Field screening of samples for gross-alpha radioactivity is conducted using a hand-held alpha scintillation detector and a ratemeter. The detector is held close to contact with the sample or core and is capable of detecting on the order of 100 to 200 pCi/g for a damp soil sample. However, detection of alpha activity can be difficult in moist samples because of shielding by the water. The instrument cannot identify specific radionuclides.

4.2.1.3 Gross-Beta Radiological Screening

Field screening of samples for gross-beta radioactivity is conducted using a hand-held detector. A typical beta detector consists of a Geiger-Mueller tube with a thin mica window protected by a sturdy wire screen. When held close to contact with the sample or core the detector (with window thickness between 1.4 to 2 mg/cm^2) is capable of detecting gross beta activity down to energies of 40 keV. The gamma sensitivity of such a detector is approximately 3 600 cpm/mR/h. The beta efficiency (determined as percentage of 2π emission rate, from a 1-in.-diameter source) with screen in place is nominally 45% for strontium-90 and 10% for carbon-14. Screen removal increases efficiency by 45%. This beta detector is alpha sensitive above 3 MeV.

4.2.2 Organic Vapor Detectors

Organic vapor detectors will be used to screen borehole cores and soil samples at the point of collection to identify grossly contaminated samples. PIDs and FIDs (described in Subsection 4.1.2 of this appendix) will be used to improve the probability of detecting a wide range of vapors.

4.2.3 Polychlorinated Biphenyls

Portable enzyme-linked immunosorbent assay kits such as PCB-RISc kits will be used to identify areas of polychlorinated biphenyl (PCB) contamination in the field. Manufacturer's instructions and the draft SW-846 Method 4020 will be followed in using these kits. The method is designed to provide indication of PCB contamination above 5 ppm. When necessary, selected confirmation samples for laboratory analysis will be collected from areas to confirm the results of the PCB screening kits.

4.2.4 Lithologic Logging

Lithologic logging of drill cores to describe the physical nature of borehole cores will be performed by a geologist capable of describing subsurface lithologies and differentiating the various strata of Bandelier Tuff.

5.0 FIELD ANALYSES

Section 3.0 of this appendix defines field analyses used in this work plan. These analyses will be used to identify areas of contamination, to select samples for confirmation by laboratory analysis, and to provide preliminary and final radiological and chemical analysis of samples ~~as appropriate.~~ The radiological analyses will be conducted using the ~~CST-9~~ radiological analysis van in accordance with ~~CST-9~~ Inorganic Trace Analysis Group procedures series MRL100 through MRL400. In addition, the mobile chemistry van will be used to provide chemical analyses. Mobile radiochemical and chemical analyses will be conducted either on-site or at an easily accessible location, following the analyses described in Subsections 5.1 and 5.3 ~~of this document.~~ At the discretion of the ~~(FPL)~~ field project leader and mobile laboratory personnel, experimental conditions may be adjusted to provide the necessary analytical sensitivity, selectivity, precision, and bias. For example, counting times for radiological analyses may be adjusted to provide required sensitivities while maintaining acceptable turnaround times. The field analyses will be conducted using field GC/FID ~~as~~ described in Subsection 5.2 ~~and~~ x-ray fluorescence ~~as~~ described in Subsection 5.3.

Ans: Now EWD (p4-10) references CST-12's admin procedures for radio chemistry. Which is correct?

5.1 Field Radiological Analyses

For areas with suspected radiological contamination, an accurate estimate of sample radioactivity is required before the samples can be submitted to the SCF. The CST-9 ~~field~~ radiological analysis van will be used to conduct preliminary radiological analyses to ensure samples fall within Department of Transportation (DOT) shipping limits. The results of these analyses will also be used to identify areas of radiological contamination ~~and to provide an~~ indication ~~as to~~ which radioelements are likely present ~~In addition, the mobile radiological analysis laboratory will be used to~~ provide ~~definitive~~ analyses where appropriate. Use of the radiological analysis van ~~This~~ will minimize sample turnaround times that may

contribute to sampling decisions in the field and ultimately translate to reduced costs. The decision to use the mobile radiological laboratory or to send samples to fixed laboratories rests ultimately with the field project leader (FPL) but may be delegated as necessary. Field radiological analyses are discussed in the following subsections.

5.1.1 Gross-Alpha and Gross-Beta Radioactivity

Measurements of gross-alpha and beta radioactivity can be used to assess the presence of plutonium, uranium, and americium in samples although identification of individual radionuclides is not possible by this method. Despite their limitations regarding analyte selectivity, these measurements can be used to guide field operations, bias sample selection, or provide an initial assessment of the sample radioactivity for health and safety purposes.

The method uses dried soil samples in a fixed geometry with measurement times of 15 to 20 minutes. Detection limits are approximately 60 pCi/g for alpha emitters and 20 pCi/g for beta emitters.

5.1.2 Gamma Spectrometry

Gamma spectrometry can be used to quantify gamma-emitting radionuclides in soil samples by determining the intensities of gamma photons emitted over a range of energies. Dried soil samples are counted in a fixed geometry using computer-based multichannel analyzers equipped with NaI or germanium detectors. Detection limits are isotope specific.

5.2 Field GC/FID

Field GC/FID analyses will be used to identify areas with hydrocarbon contamination; for example, to identify the extent of areas to be excavated during VCAs. An adaptation of SW-846 Method 8015 or 418.1 for total petroleum hydrocarbons (TPH) will be used and confirmatory samples will be sent for fixed laboratory analysis to verify that petroleum contamination has been remediated. The field method, sensitive below the proposed 100 ppm cleanup levels, can be standardized against various petroleum products (for example, Stoddard solvent or diesel fuel) or site-specific materials (for example, spilled petroleum products that have weathered).

5.3 Mobile Chemistry Analyses

To the extent practicable, the mobile chemistry van will be used for polychlorinated biphenyls, total petroleum hydrocarbons, semi-volatile organics, and volatile organics analyses. The (CST-12) procedures series MLO274 through MLO720 will be used for these analyses. The intent is to minimize turnaround times, sample handling, and analyses costs; yet provide data at a level of analyses appropriate for making future sampling and cleanup decisions. The mobile chemistry analytical procedures are based on standard Environmental Protection Agency (EPA) analytical protocols.

5.3.1 X-Ray Fluorescence Probe for Metals

Metal concentrations in solid matrices may be determined using x-ray fluorescence (XRF) spectroscopy. Instrumentation consists of a source for sample excitation (x-ray tube or radioisotope), a solid-state or proportional counter detector, a sample chamber, and an energy analyzer. Dried soil or crushed debris samples are placed in a sample chamber, excited, and counted for finite time periods (e.g., 400 seconds).

Metal action-level detection limits may not be achieved in field instruments, in which case gross concentrations of metals may still be detected. Even gross metals concentrations will provide valuable information for soil or debris assessment. An ER SOP for XRF analyses is currently in technical review. The field team will follow guidance from the XRF SOP if it is approved by the time sampling activities begin. Otherwise, calibration and field procedures recommended by the instrument manufacturer will be followed.

6.0 LABORATORY ANALYSES

Subsection 3.2 of this appendix provides the definition of laboratory analyses as used in Addendum 1. Data generated in fixed laboratories are intended to be of the highest quality. As described in Subsection 2.5 samples submitted to an analytical laboratory will be packaged, shipped, and tracked by the ER Project's Sample Coordination Facility.

Table D-3 is a summation of analytical methods for sample analyses. The following list clarifies a few of the analytical methods that appear in Table D-3.

TABLE D-3

SUMMARY OF ANALYTICAL METHODS FOR THE ANALYSES OF SAMPLES COLLECTED AT OU 1114

SAMPLE TYPE	METHOD USED	METHOD DETECTION/ QUANTITATION LIMIT IN SOILS
Radionuclides		
Gross alpha	Gas flow proportional counter	4.0-10.0 pCi/g [a]
Gross beta	Gas flow proportional counter	5.0-12.0 pCi/g [a]
Gamma spectrometry	High-purity germanium gamma-ray spectrometry	0.1-2.0 pCi/g [a]
Isotopic plutonium (plutonium-238, -239, -240)	Ion exchange and alpha spectrometry	0.02 pCi/sample [b]
Isotopic uranium (uranium-234, -235, -238)	Ion exchange and alpha spectrometry	3.00 pCi/g [b]
Strontium-90	Solvent extraction and beta counting	0.50 pCi/g [b]
Tritium	Distillation and liquid scintillation	2.50 pCi/total activity, or 500 pCi/L per 5 ml sample [b]
Organics		
Herbicides	EPA SW-846 Method 8150	0.05-167.0 ppm [c]
Organochlorine pesticides	EPA SW-846 Method 8080	0.0014-0.16 ppm [c]
Organophosphorus pesticides	EPA SW-846 Method 8140	0.02-3.35 ppm [c]
Polychlorinated biphenyls	EPA SW-846 Method 8080	0.045 ppm [c]
PCB/immunoassay	EPA SW-846 Method 4020 [c]	5.0 ppm [c]
Semivolatile organic compounds	EPA SW-846 Method 8270	0.10-3.30 ppm [c]
Total petroleum hydrocarbons	EPA Method 418.1 [d]	10 ppm [d]
Volatile organic compounds	EPA SW-846 Method 8240	0.005-0.10 ppm [c]
Metals		
Mercury	EPA SW-846 Method 7471	0.2 ppm [c]
OU 1114 and Subpart S metals suite (arsenic, barium, beryllium, cadmium, chromium, lead, nickel, selenium, silver), Appendix VIII or TAL metals suite	EPA SW-846 Method 6010 [c]	See Table D-4
Appendix VIII or TAL metals suite	EPA SW-846 Method 7000 [c]	See Table D-4
Miscellaneous		
Cyanide	EPA SW-846 Methods 9010 and 9012[a]	1.0 ppm [c]

a DOE 1983, 0516
b LANL 1992, 0520
c EPA 1992, 1507
~~d EPA 1983, 0238~~
d A dilution factor of 100 was applied to the detection limit reported
e EPA ~~1990, 17-821~~ 0814

EPA 1994 [illegible] the replacement document. [illegible]

- **Gross alpha/beta/gamma.** This refers to the laboratory analysis for the total activity of the sample for each of these types of radiation.

- **Isotopic analyses.** The following isotopic analyses may be selected based on the gross alpha/beta/gamma analyses done in the radiological van.

- **Gamma spectroscopy.** This refers to quantification of individual radionuclides by measurement of photon emissions over a range of energies.

- **Isotopic plutonium.** Radiochemical separation of plutonium from soil is followed by alpha spectrometry to quantify each isotope of plutonium.

- **Isotopic uranium.** Radiochemical separation of uranium from soil is followed by alpha spectrometry to quantify each isotope of uranium.

- **Strontium-90.** This refers to radiochemical separation using multiple selective precipitation and counting of beta activity by gas proportional detectors.

- **Tritium.** This refers to measurement of tritium in soil moisture. Soil moisture is distilled from soil, and the low-energy beta emission from tritium is measured by liquid scintillation techniques.

- **CFR Appendix VIII Metals Suite.** The 40 CFR Appendix VIII metals suite or the target analyte list (TAL) metals will be used as the default list of metals where no subset has been specified for analysis. At OU 1114 there is no documented use of several metals on the Appendix VIII or TAL metals list (including antimony, arsenic, barium, selenium, thallium, and vanadium). For several metals on the Appendix VIII list (including aluminum, cobalt, iron, manganese, and zinc), the screening action levels (SALs) are far higher than any waste concentrations expected at

the site, or are such common constituents in the environment that no SALs have been defined for soil. Table D-4 compares the TAL metals list and the OU 1114 Appendix VIII default suite to the SAL in soil.

- **Mercury** (SW-846 Methods 7470, 7471). Method 7470 is the standard EPA method for quantification of mercury in aqueous waste and groundwater. Method 7471 is the EPA method for quantification of mercury in solid and sludge-type waste.

- **Cyanide** (SW-846 Methods 9010, 9012). Methods 9010 and 9012 are the standard EPA methods for quantification of cyanide in an aqueous waste or leachate.

7.0 SAMPLING METHODS

7.1 Introduction

For the field sampling plans used in Addendum 1, ~~a suite~~ of specific sampling methods ~~has~~ have been selected and the details of their uses and applications in the field have been carefully defined below. In addition to consistency of operations and minimization of repeated information, this standardization provides comparability of sample analysis results from location to location in OU 1114.

For each method identified below, the specifically defined portion is detailed; however, complete specification of the method requires additional information that is referenced to the applicable SOP or provided in the field sampling plan (e.g., nominal or target depth for a borehole).

7.2 Soil Sampling Methods

7.2.1 Surface Soil Samples

Surface soil samples are defined as samples taken from the upper 12 in. of soil. This type of soil sample shall be gathered using a stainless steel or Teflon™ scoop. Care must be used to take the sample to a full 12-in. depth

TABLE D-4

ANALYTE LISTS COMPARED

TARGET ANALYTE LIST (TAL LIST)	OU 1114 ANALYTE LIST (APPENDIX VIII LIST)	SAL IN SOIL [a] (mg/kg)
Aluminum		c [b]
Antimony	Antimony	32.00
Arsenic	Arsenic	c [b]
Barium	Barium	5 600.00
Beryllium	Beryllium [d]	c [b]
Cadmium	Cadmium [d c]	80.00
Calcium	Calcium	c [b]
Chromium III	Chromium III	80 000.00
Chromium VI	Chromium VI [d c]	400.00
Cobalt		c [b]
Copper		3 000.00
Cyanide		1 600.00
Iron		c [b]
Lead	Lead [d c]	400.00
Magnesium		c [b]
Manganese		11 000.00
Mercury	Mercury [d c]	24.00
Nickel	Nickel [d c]	1 600.00
Potassium		c [b]
Selenium	Selenium	400.00
Silver	Silver [d c]	400.00
Sodium		c [b]
Thallium	Thallium	6.40
Uranium		240.00
Vanadium	Vanadium	560.00
Zinc		24 000.00

Q: What units of measure - ppm?

Q: How all soil SALs from this document? (except lead)

(except SAL for lead) Soil SALs are from the 1993 IWD

a (LANL 1993, 1017).

~~b A dilution factor of 100 was applied to the reported detection limit (EPA 1992, 1207).~~

b c Background comparison should be performed for this compound to determine if further action is required.

c d These metals constitute the OU 1114 metals suite. Analysis for the remaining metals will only occur at the waste water treatment system aggregate and the Sigma Mesa solar pond.

d e Soil SAL based on EPA OSWER Directive 9355.4-12 (EPA 1994, ~~17-1013~~ 1209).

and to cut the sides of the hole vertically to ensure that equal volumes of soil are taken from sample to sample over the full 12-in. depth. The applicable SOPs are LANL-ER-SOP-06.09, R0, Spade and Scoop Method for Collection of Soil Samples and LANL-ER-SOP-06.10, R0, Hand Auger and Thin-Wall Tube Sampler.

7.2.2 Undisturbed Surface Soil Samples

Undisturbed soil samples shall be gathered from the first six inches of soil using the ring sampler method. This method involves driving a four-inch-diameter stainless steel tube (ring sampler) vertically into the area to be sampled. The soil around the ring sampler is then excavated so that the tube can be removed. An undisturbed core sample is obtained by pushing the soil from the ring sampler. The applicable SOP is LANL-ER-SOP-06.11, R0, Stainless Steel Surface Soil Sampler.

7.2.3 Deposition-Layer Soil Samples

Deposition-layer soil samples are those samples collected from the first one inch of soil. Samples collected using this method represent wind- or air-deposited contaminants on the soil surface (i.e., contaminants dispersed and deposited from stack emissions). They shall be collected by using a stainless steel or Teflon trowel to scrape off the upper one inch of soil. The applicable SOP is LANL-ER-SOP-06.09, R0, Spade and Scoop Method for Collection of Soil Samples.

7.2.4 Manual Shallow-Core Samples

Small volume soil samples can be recovered from depths approaching 10 ft with a hand auger or with a thin-wall tube sampler. The thin-wall tube sampler provides a less disturbed sample than that obtained with a hand auger. However, it may not be possible to force the thin-wall tube sampler through some soil or tuff, and sampling with the hand auger may be the more viable alternative. The applicable SOP is LANL-ER-SOP-06.10, R0, Hand Auger and Thin-Wall Tube Sampler.

7.3 Chip Samples

Chip samples are destructive samples collected to be representative of porous surfaces such as asphalt, concrete, wood, brick, unglazed clay pipe, and tuff. Destructive porous surface techniques are used for any porous object considered too large for collection, such as a discrete sample. Examples include intact structures such as a roadbed or wall, chunks of debris too large for transport, boulders or bedrock surfaces, and surfaces of functioning structures. Chip sampling requires a chisel, drill, hole saw, or similar tool to collect a minimum of 100 grams of sample to a maximum depth of 1 inch. The applicable SOP is LANL-ER-SOP-06.28, R0, Chip Sampling of Porous Surfaces.

Trenches may be used to evaluate geologic features such as soils or stratigraphy. The minimum trench dimensions sufficient to expose significant geologic materials and relationships on the trench wall are generally 5 to 12 ft deep by 3 ft wide. The actual dimensions may vary depending on site and geologic conditions and available equipment. Trenching will also vary considerably depending on topography, ease of excavation, and available equipment. Soil samples will be collected from the backhoe bucket using the LANL-ER-SOP-06.09, R0, Spade and Scoop Method for Collection of Soil Samples to preclude the need for a confined space entry permit.

7.4 Liquid Samples

The Coliwasa is designed for collecting liquid hazardous wastes. It permits the representative sampling of multiphase wastes with a wide range of viscosity, corrosivity, volatility, and solids content. The main parts of the Coliwasa consist of a sampling tube, stop-cock, and closure system. The sampling tube is a 5-ft by 1.625-in. diameter translucent plastic pipe (usually polyvinyl chloride), or a borosilicate glass plumbing tube. The plastic Coliwasa is used to sample most containerized liquid wastes except wastes that contain ketones, nitrobenzene, dimethylforamide, mesityl oxide, and tetrahydrofuran. The glass Coliwasa is used to sample all other containerized liquid wastes except for strong alkali and hydrofluoric acid solutions. The applicable SOP is LANL-ER-SOP-06.15, R0, Coliwasa Sampler for Liquids and Slurries.

REFERENCES

DOE (US Department of Energy), 1983. "EML Procedures Manual," HASL-300, Environmental Measurements Laboratory, 26th edition, Washington, DC. (DOE 1983, 0516)

EPA (US Environmental Protection Agency), 1983. "Methods for Chemical Analysis of Water and Wastes," Washington, DC. (EPA 1983, 0288)

EPA (US Environmental Protection Agency), March 1987. "Data Quality Objectives for Remedial Response Activities, Development Process," EPA 540/G-87/003, OSWER Directive No. 9355.0-7B, prepared by CDM Federal Programs Corporation, Washington, DC. (EPA 1987, 0086)

EPA (US Environmental Protection Agency), April 1, 1990. "Statement of Work for Inorganics Analysis," Document number ILM01.0, USEPA Contract Laboratory Program, Washington, DC. (EPA 1990, 17-821)

EPA (US Environmental Protection Agency), July 1992. "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, Third Edition, Final Update 1, Office of Solid Waste and Emergency Response, Washington, DC. (EPA 1992, 1207)

EPA (US Environmental Protection Agency), July 14, 1994. "Revised Interim Guidance on Establishing Lead Cleanup Levels at Superfund Site," OSWER Directive 9355.412, Office of Solid Waste and Emergency Response, Washington, D.C. (EPA 1994, 17-1013)

LANL (Los Alamos National Laboratory), November 1991. "Installation Work Plan for Environmental Restoration," Revision 1, Los Alamos National Laboratory Report LA-UR-91-3310, Los Alamos, New Mexico. (LANL 1991, 0553)

LANL (Los Alamos National Laboratory), April 1992. "Health and Environmental Chemistry: Analytical Techniques, Data Management, and Quality Assurance," Los Alamos National Laboratory Report LA-10300-M, Volumes 1 and 2, Los Alamos, New Mexico. (LANL 1992, 0520)

Not cited

LANL (Los Alamos National Laboratory). November 1992. "Installation Work Plan for Environmental Restoration." Revision 2, Los Alamos National Laboratory Report LA-UR-92-3795, Los Alamos, New Mexico. **(LANL 1992, 0768)**

1993 IWP ✓ LANL 1993, 1017

OU 1114 Work Plan ✗ LANL 1993, 1090

1994 IWP ✗ LANL 1995, 1164

✓ Please copy the entire reference from the Master Ref. List.

June 8, 1995

TO: Tom Johnston, Neptune, FAX 662-0500

FROM: Margaret Burgess, CIC-1, FAX 5-4632 Margaret

SUBJECT: APPENDIX D REFERENCE

On Table D-3 you cited 17-821 as the footnote for "1," under the column heading Method Detection/Quantitation Limit in Soils for cyanide. I found EPA 1991, 0814 on Betsy Barnett's Master Reference List. Can we cite the more current document?

EPA (US Environmental Protection Agency), April 1, 1990. "Statement of Work for Inorganics Analysis," Document number ILM01.0, USEPA Contract Laboratory Program, Washington, DC. **(EPA 1990, 17-821)**.

EPA (US Environmental Protection Agency), September 1991. "Contract Laboratory Program Statement of Work for Inorganics Analysis: Multimedia, Multi-Concentration," Document No. ILM02.1, Office of Emergency and Remedial Response, Washington, D.C. **(EPA 1991, 0814) Unverified.**

Please return this note with your copy of Appendix D. Thank-you.

Ask for about SW846 Method 9020 in 1994 document

Tom, Did you receive this note 6-9-95?

Margaret,

Pls call Joan Fisk (667-0118) regarding this issue per our telephone conversation.

Thanks,

Tom J.

662-0707 x20

Margaret,

Her is the reference number and title for the SW-846 test methods as received from B. Barnett today:

~~1222~~ EPA (US Environmental Protection Agency). "Test Methods for Evaluating Solid Waste," Volumes IA, IB, IC, and II, SW-846, Third Edition, Office of Solid Waste and Emergency Response, Washington, DC. (EPA, 1222)

Tom J.

6-17-95

TJ

EDITING WORK SHEET

Acronym or Hyphenation List

A AP 7	B	C CRZ 5 CPM 13 CCE 15 CRZ 3 CST-9 18
D DOE 3 DOT 18	E ESGH 2 ER 4 EPL 20	F FTL 4 FED 12 FEDLER 9 FPL 18
G GC 12	H	I IWP 1
J	K	L LANL 12
M	N	O OU 1
P PRSS 1 PED 14 PCB 17	Q GAPJP 2 GC 2 GAPP 4 GA 8	R RPF 4
S SOPs 2 SOF 4 SSO 4 SALS 22	T TLD 5 TPA 19 TRM 22	U
V VCAP 12	W	XYZ XLF 20

Tom Johnston's copy of Appendix D

General: we should remove the redundancy in the SOP and simply state the fact that most common elements of the will be used otherwise in reviews of the SOP and reviews of the work plan

1.0 INTRODUCTION

This appendix limits the repetition of information related to field investigations by describing elements that are common to ~~such~~ field investigations at all Operable Unit (OU) 1114 potential release sites (PRSs). Those elements include:

- releases of radioactive materials without simultaneous release of hazardous constituents;
- the release of hazardous constituents at some PRSs may not have been associated with the release of radioactive materials, but human activities and action by physical forces would have diluted this isolation effect;
- the potential use of field surveys and field screening to identify gross contamination and assist in sample selection for laboratory analyses;
- the potential use of field laboratory analyses to guide field operations; and,
- the use of analytical laboratory analyses to complete the sampling/analyses planned at each phase of site investigation.

no equivalent subsection in '94 IWP.

The primary focus of this appendix is on field investigation methods. It is based on the field sampling methods sub section of the Laboratory's Installation Work Plan (IWP), Subsection 4.4 (LANL 1993, 1017). The methods described (see Sections 4.0 to 7.0 of this appendix) include:

- field survey methods to identify contaminants *in situ* and field sample screening methods to be used at the point of sample collection;
- field analytical methods;
- analytical laboratory methods; and,
- sampling methods.

evaluations, a Department of Energy (DOE) environmental checklist for either categorical exclusion or environmental assessment will be completed.

2.2 Excavation Permits

As part of the ES&H questionnaire process, excavation permits are required by the Laboratory prior to any excavation, drilling, or other invasive activity. Acquisition of the permits will be coordinated with the Laboratory's ~~Safety and~~ Facility Risk ~~Assessment~~ Management Group (~~HS-3~~ ESH-3) and Johnson Controls World Services, Inc. Acquisition of excavation permits must be scheduled as appropriate for each phase of fieldwork. All areas intended for excavation, drilling, or sampling deeper than 18 in. must be marked in the field for formal clearance prior to the work.

Au: Is ESH-3 correct? Yes. TEJ 6-12-95

2.3 Health and Safety

Annex III of the RFI Work Plan for OU 1114 presents the Health and Safety Project Plan for all field activities within OU 1114 (LANL 1993, 1090). The plan presents PRS-specific information regarding known or suspected contaminants and the personal protection required for performing various field activities. Samples acquired as part of this RFI work plan shall be screened at the point of collection to identify the presence of gross contamination or conditions that may pose a threat to the health and safety of field personnel. The field screening techniques listed in Subsection 4.2 of this appendix will be used.

2.4 Support Services

Physical ~~support services during the~~ field investigation ~~will be provided by~~ the Laboratory ~~Design~~ Facility Project Delivery Group (~~FSS-6~~), ~~Field~~ Operations and Maintenance Service Group (~~FSS-9~~), Johnson Controls, or other contractors/subcontractors. Existing job ticket procedures will be used. The services these groups will provide include, but are not limited to: excavating using backhoes and front-end loaders, moving pallets of drummed auger cuttings and decontamination solutions, and setting up signs and other warning notices around the perimeter of work areas.

Au: Correct groups? Yes. TEJ 6-12-95

Post-it® Fax Note 7671	Date 6-13-95	# of pages ▶ 15
To Tom Johnston	From Margaret Burgess	
Co./Dept. Neptune	Co.	
Phone # 662-0707, 20	Phone # 5-4173	
Fax # 662-0500	Fax # 5-4632	

entifies several aspects of the Laboratory's d sampling process that are not mentioned in the ng plans. Standard activities that will be used to support field operations (see Section 2.0, General Field Operations) include:

- laboratory-required preliminary activities and support procedures;
- identification and documentation of locations that have been sampled;
- sample handling and laboratory coordination procedures;
- equipment decontamination procedures; and,
- management of wastes generated by sampling activities.

Specific information such as sampling locations or target depths of boreholes is provided by the individual field sampling plan. The method descriptions presented here are intended to complement the site-specific Quality Assurance Project Plan (QAPjP), Annex II ~~of Addendum 1~~ and the governing standard operating procedures (SOPs).

Where reference is made to work conducted in accordance with particular procedures, it is understood that the most current revision of the procedures will be used.

2.0 GENERAL FIELD OPERATIONS

Activities not associated with physical, radiological, or chemical analyses of environmental samples are described in this section.

2.1 Archaeological, Cultural, and Ecological Evaluations

Prior to initiating fieldwork and as part of the Laboratory's environment, safety, and health (ES&H) questionnaire process, archaeological and ecological evaluations shall be performed in all areas where the surface is to be disturbed, vegetation is to be removed, or invasive sampling is to be performed. Depending on the results of the archaeological and ecological

2.5 Environmental and QC Sample Coordination

The Sample Coordination Facility (SCF) has been established by the Environmental Restoration (ER) Project to provide consistency for all investigations with regard to sample handling and tracking. The SCF is to be notified at least 30 days prior to implementing the sampling operation. The notification will serve to alert the SCF to the numbers and types of environmental samples and quality control (QC) samples to be collected and shipped. With the assistance of the SCF the numbers and types of sample bottles required to support the field effort, and the laboratories to which the samples will be shipped, can be determined. SOPs governing field quality control samples and environmental ~~sample collection,~~ identification, shipping, etc. are identified in the ~~LANL ER Project~~ Quality Assurance Project Plan (QAPP) (LANL ~~1991, 0553~~ 1995, 1164) and Subsection 2.9 of Appendix ~~D~~ The Records Processing Facility (RPF) or a well maintained set of controlled procedures should also be consulted to identify changes to existing procedures or additional procedures that govern sampling operations.

Chapter 4 in the IWP

Descriptions of the ~~use and intended purpose~~ of each kind of QC sample ~~are~~ is provided in the ~~LANL ER Project QAPP~~ (LANL ~~1991, 0553~~ 1995, 1164). The frequency with which each type of field QA sample is to be collected is detailed in the sampling plans in Chapter 5 of Addendum 1.

2.6 Site Control

Access, staging, and sample storage areas will be designated by the field team leader (FTL). To maintain sample integrity and adequate sample documentation, all sampling sites will be included in one or several exclusion zones. Exclusion zones will be delineated by the FTL with the concurrence of the site safety officer (SSO). The boundary of an exclusion zone will be defined based on the nature, magnitude, and extent of confirmed or possible contamination; the potential for contaminant migration; hazards at the site, for example, use of mechanical equipment; the presence of electrical lines or other utilities, structures, tanks, pits, or trenches; and the presence of steep banks or cliffs.

Boundaries of exclusion zones may be changed as operations progress. All changes shall be designated by the FTL or designee with the concurrence of the SSO.

2.7 Site Monitoring

The OU 1114 Health and Safety Plan details procedures required to ensure the health and safety of field personnel during fieldwork (LANL 1993, 1090). Entry into and egress from sites will be controlled for monitoring purposes. All personnel entering the sites must use appropriate radiation monitoring badges, ~~i.e.~~, thermoluminescent dosimeters (TLDs), and other monitoring devices as specified by the SSO. Locations for drinking water, restroom facilities, etc., will be identified by the SSO prior to the start of site activities. Protective clothing requirements will be determined by the SSO assigned to the project.

Field measurements for wind-borne contaminants shall be made and documented prior to, during, and after surface sampling activities. Qualified health and safety personnel (or designees) are responsible for this monitoring. Results of monitoring will be used to evaluate possible existing hazards at the site in order to ~~ascertain~~ determine current conditions and specify personal protective equipment. All personnel are required to visually monitor for extreme weather conditions, lightning, or other physical or environmental hazards that may develop. Personnel are required to notify the SSO when unanticipated physical or environmental hazards develop. Potential site hazards are discussed in detail in Annex III of the RFI Work Plan for OU 1114 (LANL 1993, 1090).

2.8 Contamination Control

To ensure sample integrity, to maintain control over sampling waste, and to avoid contamination of the site office, decontamination may be required for personnel, equipment, and vehicles moving from one zone to another. Therefore, a contamination reduction zone (CRZ) surrounding the exclusion zone(s) shall be established. A contamination reduction corridor, the size of ~~which~~ the corridor will depend on the number of stations required for decontamination

Ans: See C.8 in the new Health and Safety Plan. DOE specifies two corridors - one for personnel & one for equipment

OK

Total for personnel and one for equipment, shall be established in the CRZs.

- LANL-ER-SOP-01.02, R0, Sample Containers and Preservation;
- LANL-ER-SOP-01.03, R1, Handling, Packaging, and Shipping of Samples; and,
- LANL-ER-SOP-01.04, R2, Sample Control and Field Documentation.

2.10 Equipment Decontamination

Decontamination is performed as a quality assurance measure and a safety precaution. All equipment decontamination practices shall conform to the requirements of the approved site-specific waste management plan. Decontamination prevents cross-contamination among samples and helps maintain a clean working environment for the safety of personnel. Sampling tools are decontaminated by washing, rinsing, and drying. Disposable sample collection devices will be used as deemed necessary to eliminate costly decontamination procedures in the field. The effectiveness of the decontamination process is documented through equipment rinsate blanks submitted for laboratory analysis. Steam cleaning is used for large machinery, vehicles, auger flights, and coring tools used in borehole sampling. Decontamination fluids, including steam-cleaning fluids, are considered wastes and must be collected and contained for proper disposal.

and in LANL-ER-SOP-1.08, R0, Field Decontamination of Drilling and Sampling Equipment

This equipment [illegible] no longer required unless prior design efficiency is anticipated [illegible]

2.11 Waste Management

Wastes produced during sampling activities may include borehole auger cuttings, excess samples, excavated soil from trenching, decontamination and steam-cleaning fluids, and disposable materials such as wipes, protective clothing, and sample bottles. Hazardous waste, low-level radioactive waste, transuranic waste, and mixed waste (either low-level or transuranic) may be encountered in OU 1114. Requirements for segregating, containing, characterizing, treating, and disposing of each type and category of waste are provided in an administrative procedure (AP), LANL-ER-AP-05.3, R0, Management of Environmental Restoration Program Waste.

activities ~~shall be established through the CRZ.~~ The corridor should be located in a direction that is generally upwind from the exclusion zone.

If required, decontamination stations will be set up to reduce contamination as personnel move toward the end of the contamination reduction corridor. ~~The system shall ensure that all sample containers, waste containers, protective equipment, tools, and other equipment are washed and rinsed at least once.~~ A sequential doffing of protective equipment shall be conducted, starting with the most heavily contaminated items at the first station and progressing to the least contaminated items at the final station. The stations shall be far enough apart to minimize cross-contamination. The spacing will be based on best professional judgment of the FTL.

Decontamination and waste management shall be controlled through proper implementation of the site-specific ~~OU 1114~~ Waste Management Plan. All decontamination materials must be stored in drums with proper labels and identifying information. Efforts shall be made to keep the volume of decontamination materials to a minimum. Persons involved in performing the actual decontamination will generally be dressed in protective clothing one level below what the exclusion zone workers are required to wear. Prior to leaving an exclusion zone or central decontamination area, all personnel and equipment shall be monitored by a radiation control technician for radioactive contamination. The choice of monitoring technique is to be decided by the FTL (or FTL designee) and the SSO.

Personnel entering an exclusion zone in which personnel decontamination is required must follow the specified decontamination procedures. Personnel who are not required to wear the maximum level of protective clothing may bypass the decontamination stations for protective clothing that they are not wearing.

2.9 Sample Control and Documentation

Sample packaging, handling, chain-of-custody, documentation, and shipping procedures are provided in the following ER Project SOPs.

- LANL-ER-SOP-01.01, R0, General Instructions for Field Investigations;

3.0 STANDARD SCREENING METHODS

In all sampling plans of this Addendum 1, a ~~Screening and Analysis~~ (requirements for) table has been used to identify certain field operations ~~as well as~~ sampling and analysis ~~requirements~~. The use of such tables is described below using ~~Table D-1~~ as an example. Methods have ~~been selected~~ in accordance with requirements delineated in the ~~LANL ER Policy~~ (Chap) Quality Assurance Project Plan. (LANL 1995, 11C4)

3.1 Samples and Sampling Methods

The two columns on the left side of Table D-1 identify, by PRS, the sampling location or type and description. The next six columns identify the following: depth interval (as appropriate), total number of samples to be taken, space for recording each sample identification number, and the types and number of quality assurance (QA)/QC samples to be analyzed. The sampling methods or activities identified in the first column are specifically defined below. Sampling methods are described in detail in Section 7.0 of this appendix.

3.1.1 Use of the Standard Screening and Analysis Tables

The screening and analysis tables serve two major purposes. First, they clearly and concisely summarize the details of a sampling plan. They:

- identify sampling locations,
- indicate sampling methods and spatial sampling intervals,
- identify the screening and analysis measurements for each sample detailed in Chapter 5 of Addendum 1,
- explicitly identify the collection and analysis of field quality assurance samples, and
- give a representation of certain options and uncertainties in the plan.

The tables also provide the detail needed to estimate costs associated with the investigation.

TABLE D-1
EXAMPLE OF SCREENING AND ANALYTICAL REQUIREMENTS FOR A SAMPLING PLAN

SCREENING AND ANALYSIS FOR OU 1114

(revised March 1994)

PHASE I SAMPLING PLAN SUMMARY OF SIGMA MESA SOLAR POND

SAMPLING LOCATION/TYPE	SAMPLE LOCATION DESCRIPTION	SAMPLE DESCRIPTION: Sample depth (inches)	Sample I.D. number	Field duplicate	Field split	Collocated sample	Total samples	FIELD SCREEN: Radiation screen[1]	Organic vapor screen	FIELD LABORATORY: Rad van analysis[2]	Rad van tritium	GC/FID for TPH (SW 8015)	Immunoassay kit for PCBs (SW 4020)	LABORATORY ANALYSIS: Pesticides: Gross alpha/beta/gamma	Isotopic analyses[3]	Tritium	Organics: Herbicides (SW 8150)	Organochlorine pesticides (SW 8080)	Organophosphorous pesticides (SW 8140)	PCBs (SW 8080)	SVOCs (SW 8270)	TPH (SW 8015)	VOCs (SW 8240)	Metals: Appendix VIII metals (SW 6010, 7000)	Misc: Cyanide (SW 9010, 9012)
SWMU 60-004(c)	Temporary drum storage																								
Manual shallow core	Stained soil	0–12					1	1	1	1	1			1	•	•				1	1				
		12–18					1	1	1	1	1			1	•	•							1		
Manual shallow core	Stained soil	0–12				1	2	2	2	2	2			2	•	•				2	2				
		12–18		1			2	2	2	2	2			2	•	•							2		
Manual shallow core	25 ft south of gate	0–12					1	1	1	1	1			1	•	•				1	1				
		12–18					1	1	1	1	1			1	•	•							1		
Manual shallow core	50 ft south of gate	0–12					1	1	1	1	1			1	•	•				1	1				
		12–18					1																1		
SWMU 60-005(a)	Solar Pond																								
Liner removal	Hypalon liner	N/A					1	1	1	1															
Manual shallow core	Pond bottom (above gravel)	0–12			1		2	2	2	2	1			2	•	•					2			2	
		12–18			1		2	2	2	2	1			2	•	•					1		2	2	2
Manual shallow core	Pond bottom (above gravel)	0–12					1	1	1	1	1			1	•	•					1			1	
		12–18					1	1	1	1	1			1	•	•					1		1	1	1
Manual shallow core	Pond bottom (above gravel)	0–12					1	1	1	1	1			1	•	•					1			1	
		12–18					1	1	1	1	1			1	•	•					1		1	1	1
Manual shallow core	Pond bottom (below gravel)	0–12					1	1	1	1	1			1	•	•					1			1	
Manual shallow core	Pond bottom (below gravel)	0–12					1	1	1	1	1			1	•	•					1			1	
Manual shallow core	Pond bottom (below gravel)	0–12					1	1	1	1	1			1	•	•					1			1	
TOTAL NUMBER OF SAMPLES				1	2	1	21	21	21	21	18			20	20	20				5	15		9	11	4

sl = soil/air interface
SCB = bottom catchment basin

• Analyses will only be conducted if field screening indicates elevated levels

[1]Gross alpha, beta, and gamma using field instrumentation

[2]Gross alpha, beta, and gamma using mobile laboratory instrumentation

[3]Specific isotopic analyses described in the text

TABLE D-2
INSTRUMENTATION AND METHODS FOR PROPOSED ANALYTICAL LEVELS

FIELD SURVEY AND SCREENING	
Portable instruments:	Soil
Phoswich meter	
(FIDLER) meter (Field instrument for the detection of low-energy radiation)	
Geiger-Mueller counter ESP-1 beta/gamma meter ESP-1 alpha meter	
MicroR meter	
Organic vapor analyzer (OVA)	
Photoionization detector	
Explosimeter	
Oxygen level indicator	
Field test/methods/kits:	Soil
OVA headspace test	
HNU headspace test	
Ensys™ PCB immunoassay kits	
FIELD ANALYSIS / INSTRUMENTATION	
Radiological screening laboratory	
Field gas chromatography (GC)/flame ionization detector (FID)	
X-ray fluorescence	
LABORATORY ANALYSIS / INSTRUMENTATION	
EPA protocol for soil, air, and water analysis for semivolatile organic compounds and metals using Los Alamos, off-site, or mobile laboratories typically includes the following instrumentation (EPA 1992, 1207):	
Gas chromatography (GC)	
Gas chromatography/mass spectrometry (GC/MS)	
Inductively coupled plasma-atomic emission spectroscopy ~~(ICAP)~~ (ICP-AES)	✓
Atomic absorption (AA)	

Ans: Source is The Grow-Hill Dictionary of Scientific and Technical Terms

OK

3.2 Screening, Surveying, and Analysis Methods

Very precise language, as described below, has been adopted in Addendum 1 to refer to categories of measurements. Table D-2 summarizes instrumentation and methods to be used or designated analytical approaches.

1. **Field Surveys** (or surveys). Direct reading or recording instruments are used to scan the land surface to make measurements of *in situ* conditions. Commonly, surveys provide data of lesser precision than more definitive test methods but they can provide results very quickly. The minimal sample preparation involved generally limits surveys to collecting information related to visual observation and surficial contamination, or to contaminants emitting high energy radiation that can pass through the sample matrix to the detector. It also limits radiological and chemical information to gross categories rather than the identification and quantitation of specific contaminants. Gamma radioactivity is a common target of field surveys. Land surveys and borehole logging are also included in this category.

2. **Field Screening** (field sample screening or screening). This is the process by which instruments or observations are applied to samples at the point of collection to measure the presence of contaminants or to determine other properties of the sample. The quality of data provided by screening and the associated level of data review is comparable to survey data, but the ability to identify and quantify specific contaminants or more focused groups of contaminants is improved in some cases. Gross radioactivity (beta/gamma) and organic vapors are common targets of field screening. Lithologic logging of core samples is included in this category.

Move to p. D-10

By averaging data from replicate screens, precision comparable to laboratory analyses may be obtained.

3. **Field Analysis** (or field laboratory analysis). This category represents the initial analyses conducted on samples in the field prior to selecting samples for submission to the analytical laboratory. These analyses are conducted to provide information to direct voluntary corrective actions (VCAs) or to direct which samples are submitted for further analysis at the analytical laboratory. Sample preparation is more rigorous than that used for screening analyses, but not as rigorous as that used for laboratory analyses. This allows for collecting information beyond that which can be collected by screening or surveys alone. Field analyses may provide a quality of data that is more stringent than screening or survey data. The level of data review is generally more detailed than the reviews imposed on screening data. Analyses conducted in field radiological trailers and with the field gas chromatography (GC)/flame ionization detector (FID) are included in this category.

4. **Laboratory Analysis** (or analytical laboratory analyses). This category represents the primary analysis for which samples are collected. Because the data are generated in a highly controlled environment, the opportunity for generating data of incontestable quality is generally considered to be greater than screening, survey, or field analytical data. Of all data types, the level of quality control and data scrutiny is typically greatest for laboratory analyses. ~~Such~~ Laboratory analyses are commonly provided by off-site analytical laboratories but may be provided by Los Alamos National Laboratory (LANL) analytical groups, especially in the case of highly radioactive samples and samples requiring very rapid turnaround.

For each of the sampling categories in Table D-1, several measurement techniques are identified by vertical columns. The individual measurement techniques represented by each vertical column are identified in the following sections of this appendix: Section 4.0, Field Surveys and Screening; Section 5.0, Field Analyses; and Section 6.0, Laboratory Analyses.

4.0 FIELD SURVEYS AND SCREENING

Field surveys are primarily walking scans of the land surface using direct reading or recording instruments. Field survey data and screening data (for example, radioactivity or organic vapor measurements) are used to identify the presence of contaminants or structures in the field. While negative results from field surveys are not conclusive evidence of PCOCs below trigger levels, positive results obtained at an early stage can allow timely redirection of a sampling plan. For convenience, land surveys to identify and mark locations from old drawings are included in this category.

4.1 Field Surveys

4.1.1 Radiological Surveys

Radiological surveys are conducted to identify the presence of radioactive contamination at a site. Several instruments are suitable for these surveys: microR meters, sodium iodide (NaI) detectors of various sizes with ratemeters and scalers, Geiger-Mueller detectors (such as the ESP-1 beta/gamma meters), FIDLER, and Phoswich. The specific uses of each meter are discussed in the following subsections.

4.1.1.1 Gross Gamma Surveys

Several instruments are suitable for gross gamma surveys, including microR meters, NaI detectors of various sizes with ratemeters or scalers, and Geiger-Mueller detectors. The preferred instruments are microR meters with the ability to measure to 5 µR/hr, 2-in.-by-2-in. NaI detectors with a ratemeter capable of displaying 100 counts per minute (cpm), and the ESP-1 beta/gamma meter. Some discrete- or continuous-measurement recording instruments are also available using the same detectors. Surveys are conducted by carrying the instrument at waist height, walking at a slow pace, and observing and recording the ratemeter response. Measurements may also be made at the ground surface to aid in verifying the presence of localized radioactive contamination.

4.1.3 Combustible Gas/Oxygen Detector

A Gastech Model 1314 or its equivalent will be used to determine the potential for combustion or explosion of unknown atmospheres during drilling and intrusive activities. A typical combustible gas indicator (CGI) determines the level of organic vapors and gases present in an atmosphere as a percentage of the lower explosive limit or lower flammability limit. The Gastech Model 1314 also contains an oxygen detector to identify atmospheres that are deficient or enriched in oxygen. For health and safety purposes, the CGI will be used (if appropriate) to monitor atmospheres during some intrusive activities.

4.1.4 Land Surveys

Land surveys will be used both to document all sampling locations and, if needed, to locate either former or buried structures. In all cases, the documentation requirements for the surveys are plus or minus 1 ft horizontal and plus or minus 0.1 ft vertical. The survey procedure used is LANL-ER-SOP-03.01, R1, Land Surveying Procedures.

4.1.5 Geomorphic Mapping

Field or geomorphic mapping is required for OU 1114 to assist in the location of certain sampling points. In order to sample drainages judged most likely to contain potential contamination, some of the individual sampling plans in Chapter 5 require the identification of watercourses or drainages. Preliminary fieldwork at OU 1114 indicates that an expert field geologist is required to map current-day precipitation runoff channels. The geologist will correlate current-day drainage channels to the historic channels that would have carried effluent from OU 1114 outfall locations into the lower gradient area at the floor of the canyon. To assist in correlating current drainage channels to historic drainage channels, the geologist will use field mapping, aerial photographs, topographic maps, and other archival information. The LANL ER Project QAPP contains requirements concerning the use of archived data (LANL-1091/-0533).

Several PRS aggregate drainages and channels are well defined from the rim to the floor of the canyon. Other aggregates will require mapping as described above. Professional judgment allows placing representative

4.1.1.2 Low-Energy Gamma Surveys

Either the FIDLER or the Phoswich detector may be used for ~~Addendum 1.~~ low-energy gamma surveys. Both are optimized for the detection of low-energy gamma photons, such as the 60 keV gamma emission from americium-241 or x-rays that accompany the decay of heavy radionuclides such as uranium, thorium, plutonium, and other transuranic radionuclides. Discrete or continuous-measurement recording options are available. Surveys are conducted by carrying the instrument close to (*i.e.*, within 12 inches of) the ground surface and observing the ratemeter or scaler. Measurements may also be made at the ground surface to aid in verifying the presence of localized contamination.

4.1.2 Organic Vapor Surveys

Organic vapor detectors will be used to monitor breathing zones for personnel safety in sample collection and handling areas at OU 1114 sites. Two types of detectors, a photoionization detector (PID) and a flame ionization detector ~~(FID)~~, will be used to survey a wide range of organic vapors as described below.

4.1.2.1 Photoionization Detectors ~~(PIDs)~~

A Model PI 101 PID or its equivalent will be used. This is a general survey instrument capable of detecting real-time concentrations of many complex organic compounds and some inorganic compounds in air. The instrument can be calibrated to a particular compound; however, it cannot distinguish among detectable compounds in a mixture of detectable gases.

4.1.2.2 Flame Ionization Detectors ~~(FIDs)~~

A Foxboro Model OVA-128 FID or its equivalent will be used. An FID can be used as a general screening instrument to detect the presence of many organic vapors. Its response to an unknown sample is relative to the response ~~of~~ to a gas of known composition to which the instrument has been calibrated. Its quantitative usefulness is, therefore, limited by the comparability of the sample gas to the calibration gas.

sampling locations or establishing placement of a systematic sampling grid on field maps. Representative sampling locations must provide adequate coverage to assess dissemination of potential contaminants in the drainages. Correct use of well-documented judgmental sampling points will allow less reliance on nonjudgmental or random sampling regimens.

4.2 Field Screening

Screening measurements are applied at the point of sample collection, in borehole headspace, and in excavations to identify gross contamination and to assess conditions affecting the health or safety of field personnel. Application of screening for personnel health and safety is detailed in Annex III of this work plan and the Health and Safety Program Plan, Annex III in the IWP (LANL 1993, 1090; 1993, 1013). Individual sampling plans may not explicitly identify the use or role of sample screening measurements; however, the standard analytical table for each investigation shall show the methods to be used.

4.2.1 Radiological Screening

Radiological screening is conducted to identify the presence of gross radioactive contamination of samples and personnel. Several instruments are suitable for these surveys including microR meters, NaI detectors of various sizes with ratemeters and scalers, Geiger-Mueller detectors, and alpha scintillation detectors. The specific uses of each meter are discussed in the following subsections.

4.2.1.1 Gross-Gamma Radiological Screening

Field screening of samples for gross-gamma radioactivity will be done using a hand-held NaI detector probe and ratemeter or the ESP-1 beta/gamma meter. The NaI detector is held close to the sample or core and is capable of identifying elevated concentrations of certain radionuclides as an increased reading above instrument background levels. The response is best interpreted as a gross indicator of potential contamination.

4.2.1.2 Gross-Alpha Radiological Screening

Field screening of samples for gross-alpha radioactivity is conducted using a hand-held alpha scintillation detector and a ratemeter. The detector is held close to contact with the sample or core and is capable of detecting alpha radioactivity on the order of 100 to 200 pCi/g for a damp soil sample. However, detection of alpha activity can be difficult in moist samples because of shielding by the water. The instrument cannot identify specific radionuclides.

4.2.1.3 Gross-Beta Radiological Screening

Field screening of samples for gross-beta radioactivity is conducted using a hand-held detector. A typical beta detector consists of a Geiger-Mueller tube with a thin mica window protected by a sturdy wire screen. When held close to contact with the sample or core the detector (with window thickness between 1.4 to 2 mg/cm^2) is capable of detecting gross beta activity down to energies of 40 keV. The gamma sensitivity of such a detector is approximately 3 600 cpm/mR/h. The beta efficiency (determined as a percentage of 2π emission rate, from a 1-in.-diameter source) with screen in place is nominally 45% for strontium-90 and 10% for carbon-14. Screen removal increases efficiency by 45%. This beta detector is alpha sensitive above 3 MeV.

Au: Parens in correct places?

4.2.2 Organic Vapor Detectors

Organic vapor detectors will be used to screen borehole cores and soil samples at the point of collection to identify grossly contaminated samples. PIDs and FIDs (described in Subsection 4.1.2 of this appendix) will be used to improve the probability of detecting a wide range of vapors.

4.2.3 Polychlorinated Biphenyls

Au: RISc or RISc? RISc

Portable enzyme-linked immunosorbent assay kits such as PCB-RISc kits will be used to identify areas of polychlorinated biphenyl (PCB) contamination in the field. Manufacturer's instructions and the draft SW-846 Method 4020 will be followed in using these kits (EPA 1992, 1207). The method is designed to provide indication of PCB contamination above 5 ppm. When necessary, selected confirmation samples for laboratory analysis will be collected from areas to confirm the results of the PCB screening kits.

Au: Correct reference?

contribute to sampling decisions in the field and ultimately translate to reduced costs. The decision to use the mobile radiological laboratory or to send samples to fixed laboratories rests ultimately with the field project leader (FPL) but may be delegated as necessary. Field radiological analyses are discussed in the following subsections.

5.1.1 Gross-Alpha and Gross-Beta Radioactivity

Measurements of gross-alpha and beta radioactivity can be used to assess the presence of plutonium, uranium, and americium in samples, although identification of individual radionuclides is not possible by this method. Despite their limitations regarding analyte selectivity, these measurements can be used to guide field operations, bias sample selection, or provide an initial assessment of the sample radioactivity for health and safety purposes.

The method uses dried soil samples in a fixed geometry with measurement times of 15 to 20 minutes. Detection limits are approximately 60 pCi/g for alpha emitters and 20 pCi/g for beta emitters.

5.1.2 Gamma Spectrometry

Gamma spectrometry can be used to quantify gamma-emitting radionuclides in soil samples by determining the intensities of gamma photons emitted over a range of energies. Dried soil samples are counted in a fixed geometry using computer-based multichannel analyzers equipped with NaI or germanium detectors. Detection limits are isotope specific.

5.2 Field GC/FID

Field GC/FID analyses will be used to identify areas with hydrocarbon contamination; for example, to identify the extent of areas to be excavated during VCAs. An adaptation of SW-846 Method 8015 or 418.1 for total petroleum hydrocarbons (TPH) will be used and confirmatory samples will be sent for fixed laboratory analysis to verify that petroleum contamination has been remediated. The field method, sensitive below the proposed 100 ppm cleanup levels, can be standardized against various petroleum products (for example, Stoddard solvent or diesel fuel) or site-specific materials (for example, spilled petroleum products that have weathered).

4.2.4 Lithologic Logging

Lithologic logging of drill cores to describe the physical nature of borehole cores will be performed by a geologist capable of describing subsurface lithologies and differentiating the various strata of Bandelier Tuff.

5.0 FIELD ANALYSES

Section 3.0 of this appendix defines field analyses used in this work plan. These analyses will be used to identify areas of contamination, to select samples for confirmation by laboratory analysis, and to provide preliminary and final radiological and chemical analysis of samples ~~as appropriate~~. The radiological analyses will be conducted using the ~~CST-9~~ radiological analysis van in accordance with Inorganic Trace Analysis Group CST-9 procedures series MRL100 through MRL400. In addition, the mobile chemistry van will be used to provide chemical analyses. Mobile radiochemical and chemical analyses will be conducted either on site, or at an easily accessible location, following the analyses described below in Subsections 5.1 and 5.3 ~~of this document~~. At the discretion of the field project leader (FPL) and mobile laboratory personnel, experimental conditions may be adjusted to provide the necessary analytical sensitivity, selectivity, precision, and bias. For example, counting times for radiological analyses may be adjusted to provide required sensitivities while maintaining acceptable turnaround times. The field analyses will be conducted using field GC/FID ~~as~~ described in Subsection 5.2 and x-ray fluorescence ~~as~~ described in Subsection 5.3.

Au: Now IWP (p 4-11) references CST-12's admin procedures for radio chemistry. Which is correct?

CST-11 Nuclear and Radiochemistry

5.1 Field Radiological Analyses

For areas with suspected radiological contamination, an accurate estimate of sample radioactivity is required before the samples can be submitted to the SCF. The CST-9 ~~field~~ radiological analysis van will be used to conduct preliminary radiological analyses to ensure samples fall within Department of Transportation (DOT) shipping limits. The results of these analyses will also be used to identify areas of radiological contamination ~~and to provide an indication as to~~ which radioelements are likely present ~~In addition, the mobile radiological analysis laboratory will be used to~~ provide ~~definitive~~ analyses where appropriate. (Use of the radiological analysis van) ~~This~~ will minimize sample turnaround times that may

5.3 Mobile Chemistry Analyses

To the extent practicable, the mobile chemistry van will be used for polychlorinated biphenyls, total petroleum hydrocarbons, semivolatile organics, and volatile organics analyses. The CST-12 procedures series MLO274 through MLO720 will be used for these analyses. The intent is to minimize turnaround times, sample handling, and analyses costs; yet provide data at a level of analyses appropriate for making future sampling and cleanup decisions. The mobile chemistry analytical procedures are based on standard Environmental Protection Agency (EPA) analytical protocols.

5.3.1 X-Ray Fluorescence Probe for Metals

Metal concentrations in solid matrices may be determined using x-ray fluorescence (XRF) spectroscopy. Instrumentation consists of a source for sample excitation (x-ray tube or radioisotope), a solid state or proportional counter detector, a sample chamber, and an energy analyzer. Dried soil or crushed debris samples are placed in a sample chamber, excited, and counted for finite time periods (e.g., 400 seconds).

Metal action-level detection limits may not be achieved in field instruments, in which case gross concentrations of metals may still be detected. Even gross metals concentrations will provide valuable information for soil or debris assessment. An ER SOP for XRF analyses is currently in technical review. The field team will follow guidance from the XRF SOP if it is approved by the time sampling activities begin. Otherwise, calibration and field procedures recommended by the instrument manufacturer will be followed.

6.0 LABORATORY ANALYSES

Subsection 3.2 of this appendix provides the definition of laboratory analyses as used in Addendum 1. Data generated in fixed laboratories are intended to be of the highest quality. As described in Subsection 2.5 samples submitted to an analytical laboratory will be packaged, shipped, and tracked by the ER Project Sample Coordination Facility.

Table D-3 is a summation of analytical methods for sample analyses. The following list clarifies a few of the analytical methods that appear in Table D-3.

TABLE D-3

SUMMARY OF ANALYTICAL METHODS FOR THE ANALYSES OF SAMPLES COLLECTED AT OU 1114

SAMPLE TYPE	METHOD USED	METHOD DETECTION/ QUANTITATION LIMIT IN SOILS
Radionuclides		
Gross alpha	Gas flow proportional counter	4.0-10.0 pCi/g [a]
Gross beta	Gas flow proportional counter	5.0-12.0 pCi/g [a]
Gamma spectrometry	High-purity germanium gamma-ray spectrometry	0.1-2.0 pCi/g [a]
Isotopic plutonium (plutonium-238, -239, -240)	Ion exchange and alpha spectrometry	0.02 pCi/sample [b]
Isotopic uranium (uranium-234, -235, -238)	Ion exchange and alpha spectrometry	3.00 pCi/g [b]
Strontium-90	Solvent extraction and beta counting	0.50 pCi/g [b]
Tritium	Distillation and liquid scintillation	2.50 pCi/total activity, or 500 pCi/L per 5 ml sample [b]
Organics		
Herbicides	EPA SW-846 Method 8150	0.05-167.0 ppm [c]
Organochlorine pesticides	EPA SW-846 Method 8080	0.0014-0.16 ppm [c]
Organophosphorus pesticides	EPA SW-846 Method 8140	0.02-3.35 ppm [c]
Polychlorinated biphenyls	EPA SW-846 Method 8080	0.045 ppm [c]
PCB/immunoassay	EPA SW-846 Method 4020 [c]	5.0 ppm [c]
Semivolatile organic compounds	EPA SW-846 Method 8270	0.10-3.30 ppm [c]
Total petroleum hydrocarbons	EPA Method 418.1 [d]	10 ppm [d]
Volatile organic compounds	EPA SW-846 Method 8240	0.005-0.10 ppm [c]
Metals		
Mercury	EPA SW-846 Method 7471	0.2 ppm [e]
OU 1114 and Subpart S metals suite (arsenic, barium, beryllium, cadmium, chromium, lead, nickel, selenium, silver), Appendix VIII or TAL metals suite	EPA SW-846 Method 6010 [c]	See Table D-4
Appendix VIII or TAL metals suite	EPA SW-846 Method 7000 [c]	See Table D-4
Miscellaneous		
Cyanide	EPA SW-846 Methods 9010 and 9012[a]	1.0 ppm [f]

a DOE 1983, 0516
b LANL 1992, 0520
c EPA 1992, 1207
d EPA 1983, 0288
e A dilution factor of 100 was applied to the detection limit reported
f EPA 1990, 17-821

the site, or are such common constituents in the environment that no SALs have been defined for soil. Table D-4 compares the TAL metals list and the OU 1114 Appendix VIII default suite to the SAL in soil.

- **Mercury** (SW-846 Methods 7470, 7471). Method 7470 is the standard EPA method for quantification of mercury in aqueous waste and groundwater. Method 7471 is the EPA method for quantification of mercury in solid and sludge-type waste.

- **Cyanide** (SW-846 Methods 9010, 9012). Methods 9010 and 9012 are the standard EPA methods for quantification of cyanide in an aqueous waste or leachate.

7.0 SAMPLING METHODS

7.1 Introduction

For the field sampling plans used in Addendum 1, ~~a suite of~~ specific sampling methods ~~has~~ have been selected and the details of their uses and applications in the field have been carefully defined below. In addition to consistency of operations and minimization of repeated information, this standardization provides comparability of sample analysis results from location to location in OU 1114.

For each method identified below, the specifically defined portion is detailed; however, complete specification of the method requires additional information that is referenced to the applicable SOP or provided in the field sampling plan (e.g., nominal or target depth for a borehole).

7.2 Soil Sampling Methods

7.2.1 Surface Soil Samples

Surface soil samples are defined as samples taken from the upper 12 in. of soil. This type of soil sample shall be gathered using a stainless steel or Teflon scoop. Care must be used to take the sample to a full 12-in. depth

- **Gross alpha/beta/gamma.** This refers to the laboratory analysis for the total activity of the sample for each of these types of radiation.

- **Isotopic analyses.** The following isotopic analyses may be selected based on the gross alpha/beta/gamma analyses done in the radiological van.

- **Gamma spectroscopy.** This refers to quantification of individual radionuclides by measurement of photon emissions over a range of energies.

- **Isotopic plutonium.** Radiochemical separation of plutonium from soil is followed by alpha spectrometry to quantify each isotope of plutonium.

- **Isotopic uranium.** Radiochemical separation of uranium from soil is followed by alpha spectrometry to quantify each isotope of uranium.

- **Strontium-90.** This refers to radiochemical separation using multiple selective precipitation and counting of beta activity by gas proportional detectors.

- **Tritium.** This refers to measurement of tritium in soil moisture. Soil moisture is distilled from soil, and the low-energy beta emission from tritium is measured by liquid scintillation techniques.

- **CFR Appendix VIII Metals Suite.** The 40 CFR Appendix VIII metals suite or the target analyte list (TAL) metals will be used as the default list of metals where no subset has been specified for analysis. At OU 1114 there is no documented use of several metals on the Appendix VIII or TAL metals list (including antimony, arsenic, barium, selenium, thallium, and vanadium). For several metals on the Appendix VIII list (including aluminum, cobalt, iron, manganese, and zinc), the screening action levels (SALs) are far higher than any waste concentrations expected at

TABLE D-4

ANALYTE LISTS COMPARED

TARGET ANALYTE LIST (TAL LIST)	OU 1114 ANALYTE LIST (APPENDIX VIII LIST)	SAL IN SOIL [a]
Aluminum		c
Antimony	Antimony	32.00
Arsenic	Arsenic	c
Barium	Barium	5 600.00
Beryllium	Beryllium [d]	c
Cadmium	Cadmium [d]	80.00
Calcium	Calcium	c
Chromium III	Chromium III	80 000.00
Chromium VI	Chromium VI [d]	400.00
Cobalt		c
Copper		3 000.00
Cyanide		1 600.00
Iron		c
Lead	Lead [d]	400.00
Magnesium		c
Manganese		11 000.00
Mercury	Mercury [d]	24.00
Nickel	Nickel [d]	1 600.00
Potassium		c
Selenium	Selenium	400.00
Silver	Silver [d]	400.00
Sodium		c
Thallium	Thallium	6.40
Uranium		240.00
Vanadium	Vanadium	560.00
Zinc		24 000.00

a LANL 1993, 1017

b A dilution factor of 100 was applied to the reported detection limit (EPA 1992, 1207).

c Background comparison should be performed for this compound to determine if further action is required.

d These metals constitute the OU 1114 metals suite. Analysis for the remaining metals will only occur at the waste water treatment system aggregate and the Sigma Mesa solar pond.

e Soil SAL based on EPA OSWER Directive 9355.4-12 (EPA 1994, ~~17-1013~~ 1209).

Au: Is the unit of measure ppm?

Au: Are all soil SALs from this document (except lead)

← Are there no SAL

and to cut the sides of the hole vertically to ensure that equal volumes of soil are taken from sample to sample over the full 12-in. depth. The applicable SOPs are LANL-ER-SOP-06.09, R0, Spade and Scoop Method for Collection of Soil Samples and LANL-ER-SOP-06.10, R0, Hand Auger and Thin-Wall Tube Sampler.

7.2.2 Undisturbed Surface Soil Samples

Undisturbed soil samples shall be gathered from the first six inches of soil using the ring sampler method. This method involves driving a four-inch-diameter stainless steel tube (ring sampler) vertically into the area to be sampled. The soil around the ring sampler is then excavated so that the tube can be removed. An undisturbed core sample is obtained by pushing the soil from the ring sampler. The applicable SOP is LANL-ER-SOP-06.11, R0, Stainless Steel Surface Soil Sampler.

7.2.3 Deposition-Layer Soil Samples

Deposition-layer soil samples are those samples collected from the first one inch of soil. Samples collected using this method represent wind- or air-deposited contaminants on the soil surface (i.e., contaminants dispersed and deposited from stack emissions). They shall be collected by using a stainless steel or Teflon trowel to scrape off the upper one inch of soil. The applicable SOP is LANL-ER-SOP-06.09, R0, Spade and Scoop Method for Collection of Soil Samples.

7.2.4 Manual Shallow-Core Samples

Small volume soil samples can be recovered from depths approaching 10 ft with a hand auger or with a thin-wall tube sampler. The thin-wall tube sampler provides a less disturbed sample than that obtained with a hand auger. However, it may not be possible to force the thin-wall tube sampler through some soil or tuff, and sampling with the hand auger may be the more viable alternative. The applicable SOP is LANL-ER-SOP-06.10, R0, Hand Auger and Thin-Wall Tube Sampler.

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LANL (Los Alamos National Laboratory), April 1992. "Health and Environmental Chemistry: Analytical Techniques, Data Management, and Quality Assurance," Los Alamos National Laboratory Report LA-10300-M, Volumes 1 and 2, Los Alamos, New Mexico. (LANL 1992, 0520)

Not called out in text or table
Footnote
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TEJ 6-12-95

Replace with 1209 from Master Ref List. Then search App. D & change 17-1013 to 1209

7.3 Chip Samples

Chip samples are destructive samples collected to be representative of porous surfaces such as asphalt, concrete, wood, brick, unglazed clay pipe, and tuff. Destructive porous surface techniques are used for any porous object considered too large for collection, such as a discrete sample. Examples include intact structures such as a roadbed or wall, chunks of debris too large for transport, boulders or bedrock surfaces, and surfaces of functioning structures. Chip sampling requires a chisel, drill, hole saw, or similar tool to collect a minimum of 100 grams of sample to a maximum depth of 1 inch. The applicable SOP is LANL-ER-SOP-06.28, R0, Chip Sampling of Porous Surfaces.

Trenches may be used to evaluate geologic features such as soils or stratigraphy. The minimum trench dimensions sufficient to expose significant geologic materials and relationships on the trench wall are generally 5 to 12 ft deep by 3 ft wide. The actual dimensions may vary depending on site and geologic conditions and available equipment. Trenching will also vary considerably depending on topography, ease of excavation, and available equipment. Soil samples will be collected from the backhoe bucket using the LANL-ER-SOP-06.09, R0, Spade and Scoop Method for Collection of Soil Samples to preclude the need for a confined space entry permit.

7.4 Liquid Samples

The Coliwasa is designed for collecting liquid hazardous wastes. It permits the representative sampling of multiphase wastes with a wide range of viscosity, corrosivity, volatility, and solids content. The main parts of the Coliwasa consist of a sampling tube, stop-cock, and closure system. The sampling tube is a 5-ft by 1.625-in. diameter translucent plastic pipe (usually polyvinyl chloride), or a borosilicate glass plumbing tube. The plastic Coliwasa is used to sample most containerized liquid wastes except wastes that contain ketones, nitrobenzene, dimethylforamide, mesityl oxide, and tetrahydrofuran. The glass Coliwasa is used to sample all other containerized liquid wastes except for strong alkali and hydrofluoric acid solutions. The applicable SOP is LANL-ER-SOP-06.15, R0, Coliwasa Sampler for Liquids and Slurries.

Not cited

~~LANL (Los Alamos National Laboratory). November 1992. "Installation Work Plan for Environmental Restoration," Revision 2, Los Alamos National Laboratory Report LA-UR-92-3795, Los Alamos, New Mexico. (LANL 1992, 0768)~~

1993 IWP ✓ LANL 1993, 1017 ✓ Please copy the entire reference from the Master Ref. list.

OU 1114 Work Plan ✗ LANL 1993, 1090 ✓

1994 IWP ✗ LANL 1995, 1164 ✓

1.0 INTRODUCTION

This appendix limits the repetition of information related to field investigations by describing elements that are common to field investigations at all Operable Unit (OU) 1114 potential release sites (PRSs). Those elements include:

- releases of radioactive materials without simultaneous release of hazardous constituents;
- the release of hazardous constituents at some PRSs may not have been associated with the release of radioactive materials, but human activities and action by physical forces would have diluted this isolation effect;
- the potential use of field surveys and field screening to identify gross contamination and assist in sample selection for laboratory analyses;
- the potential use of field laboratory analyses to guide field operations; and,
- the use of analytical laboratory analyses to complete the sampling/analyses planned at each phase of site investigation.

The primary focus of this appendix is on field investigation methods. It is based on the field sampling methods subsection of the Laboratory's Installation Work Plan (IWP), Subsection 4.4 (LANL 1993, 1017). The methods described (see Sections 4.0 to 7.0 of this appendix) include:

- field survey methods to identify contaminants *in situ* and field sample screening methods to be used at the point of sample collection;
- field analytical methods;
- analytical laboratory methods; and,
- sampling methods.

This appendix also identifies several aspects of the Laboratory's implementation of the field sampling process that are not mentioned in the PRS-specific field sampling plans. Standard activities that will be used to support field operations (see Section 2.0, General Field Operations) include:

- Laboratory-required preliminary activities and support procedures;
- identification and documentation of locations that have been sampled;
- sample handling and laboratory coordination procedures;
- equipment decontamination procedures; and,
- management of wastes generated by sampling activities.

Specific information such as sampling locations or target depths of boreholes is provided by the individual field sampling plan. The method descriptions presented here are intended to complement the site-specific Quality Assurance Project Plan (QAPjP), Annex II and the governing standard operating procedures (SOPs).

Where reference is made to work conducted in accordance with particular procedures, it is understood that the most current revision of the procedures will be used.

2.0 GENERAL FIELD OPERATIONS

Activities not associated with physical, radiological, or chemical analyses of environmental samples are described in this section.

2.1 Archaeological, Cultural, and Ecological Evaluations

Prior to initiating fieldwork and as part of the Laboratory's environment, safety, and health (ES&H) questionnaire process, archaeological and ecological evaluations shall be performed in all areas where the surface is to be disturbed, vegetation is to be removed, or invasive sampling is to be performed. Depending on the results of the archaeological and ecological evaluations, a Department of Energy (DOE) environmental checklist for either categorical exclusion or environmental assessment will be completed.

Run-in

2.2 Excavation Permits

As part of the ES&H questionnaire process, excavation permits are required by the Laboratory prior to any excavation, drilling, or other invasive activity. Acquisition of the permits will be coordinated with the Laboratory's Facility Risk Management Group (ESH-3) and Johnson Controls World Services, Inc. Acquisition of excavation permits must be scheduled as appropriate for each phase of fieldwork. All areas intended for excavation, drilling, or sampling deeper than 18 in. must be marked in the field for formal clearance prior to the work.

2.3 Health and Safety

Annex III of the RFI Work Plan for OU 1114 presents the Health and Safety Project Plan for all field activities within OU 1114 (LANL 1993, 1090). The plan presents PRS-specific information regarding known or suspected contaminants and the personal protection required for performing various field activities.

Samples acquired as part of this RFI work plan shall be screened at the point of collection to identify the presence of gross contamination or conditions that may pose a threat to the health and safety of field personnel. The field screening techniques listed in Subsection 4.2 of this appendix will be used.

2.4 Support Services

Physical support services during the field investigation will be provided by the Laboratory's Facility Project Delivery Group (FSS-6), Operations and Maintenance Services Group (FSS-9), Johnson Controls, or other contractors/subcontractors. Existing job ticket procedures will be used. The services these groups will provide include, but are not limited to: excavating using backhoes and front-end loaders, moving pallets of drummed auger cuttings and decontamination solutions, and setting up signs and other warning notices around the perimeter of work areas.

2.5 Environmental and QC Sample Coordination

The Sample Coordination Facility (SCF) has been established by the Environmental Restoration (ER) Project to provide consistency for all investigations with regard to sample handling and tracking. The SCF is to be notified at least 30 days prior to implementing the sampling operation. The notification will serve to alert the SCF to the numbers and types of environmental samples and quality control (QC) samples to be collected and shipped. With the assistance of the SCF the numbers and types of sample bottles required to support the field effort, and the laboratories to which the samples will be shipped, can be determined. SOPs governing field quality control samples and environmental sample collection, identification, shipping, etc. are identified in the ER Project's Quality Assurance Project Plan (QAPP), Chapter 8 in the SOP (LANL 1995, 1164) and Subsection 2.9 of this Appendix. The Records Processing Facility (RPF) or a well maintained set of controlled procedures should also be consulted to identify changes to existing procedures or additional procedures that govern sampling operations.

A description of the use and intended purpose of each kind of QC sample is provided in the ER Project's QAPP (LANL 1995, 1164). The frequency with which each type of field QA sample is to be collected is detailed in the sampling plans in Chapter 5 of Addendum 1.

2.6 Site Control

Access, staging, and sample storage areas will be designated by the field team leader (FTL). To maintain sample integrity and adequate sample documentation, all sampling sites will be included in one or several exclusion zones. Exclusion zones will be delineated by the FTL with the concurrence of the site safety officer (SSO). The boundary of an exclusion zone will be defined based on the nature, magnitude, and extent of confirmed or possible contamination; the potential for contaminant migration; hazards at the site, for example, use of mechanical equipment; the presence of electrical lines or other utilities, structures, tanks, pits, or trenches; and the presence of steep banks or cliffs.

Boundaries of exclusion zones may be changed as operations progress. All changes shall be designated by the FTL or designee with the concurrence of the SSO.

2.7 Site Monitoring

The OU 1114 Health and Safety Plan details procedures required to ensure the health and safety of field personnel during fieldwork (LANL 1993, 1090). Ingress and egress at sites will be controlled for monitoring purposes. All personnel entering the sites must use appropriate radiation monitoring badges, e.g., thermoluminescent dosimeters (TLDs), and other monitoring devices as specified by the SSO. Locations for drinking water, restroom facilities, etc., will be identified by the SSO prior to the start of site activities. Protective clothing requirements will be determined by the SSO.

Field measurements for wind-borne contaminants shall be made and documented before, during, and after surface sampling activities. Qualified health and safety personnel (or designees) are responsible for this monitoring. Results of monitoring will be used to evaluate possible existing hazards at the site in order to determine current conditions and specify personal protective equipment. All personnel are required to visually monitor for extreme weather conditions, lightning, or other physical or environmental hazards that may develop. Personnel are required to notify the SSO when unanticipated physical or environmental hazards develop. Potential site hazards are discussed in detail in Annex III of the RFI Work Plan for OU 1114 (LANL 1993, 1090).

2.8 Contamination Control

To ensure sample integrity, to maintain control over sampling waste, and to avoid contamination of the site office, decontamination may be required for personnel, equipment, and vehicles moving from one zone to another. Therefore, a contamination reduction zone (CRZ) surrounding the exclusion zone(s) shall be established. Contamination reduction corridors, one for personnel and one for equipment, shall be established in the CRZs. The size of the corridor will depend on the number of stations required for decontamination activities. The corridors should be located in a direction that is generally upwind from the exclusion zone.

If required, decontamination stations will be set up to reduce contamination as personnel move toward the end of the contamination reduction corridor. A sequential doffing of protective equipment shall be conducted, starting with the most heavily contaminated items at the first station and progressing to the least contaminated items at the final station. The stations shall be far enough apart to minimize cross-contamination. The spacing will be based on best professional judgment of the FTL.

Decontamination and waste management shall be controlled through proper implementation of the site-specific waste management plan. All decontamination materials must be stored in drums with proper labels and identifying information. Efforts shall be made to keep the volume of decontamination materials to a minimum. Persons involved in performing the actual decontamination will generally be dressed in protective clothing one level below what the exclusion zone workers are required to wear. Prior to leaving an exclusion zone or central decontamination area, all personnel and equipment shall be monitored by a radiation control technician for radioactive contamination. The choice of monitoring technique is to be decided by the FTL (or FTL designee) and the SSO.

Personnel entering an exclusion zone in which personnel decontamination is required must follow the specified decontamination procedures. Personnel who are not required to wear the maximum level of protective clothing may bypass the decontamination stations for protective clothing that they are not wearing.

2.9 Sample Control and Documentation

Sample packaging, handling, chain-of-custody, documentation, and shipping procedures are provided in the following ER Project SOPs:

- LANL-ER-SOP-01.01, R0, General Instructions for Field Investigations;
- LANL-ER-SOP-01.02, R0, Sample Containers and Preservation;
- LANL-ER-SOP-01.03, R1, Handling, Packaging, and Shipping of Samples; and,
- LANL-ER-SOP-01.04, R2, Sample Control and Field Documentation.

2.10 Equipment Decontamination

Decontamination is performed as a quality assurance measure and a safety precaution. All equipment decontamination practices shall conform to the requirements of the approved site-specific waste management plan and in LANL-ER-SOP-1.08, R0, Field Decontamination of Drilling and Sampling Equipment. Decontamination prevents cross-contamination among samples and helps maintain a clean working environment for the safety of personnel. Sampling tools are decontaminated by washing, rinsing, and drying. Disposable sample collection devices will be used as deemed necessary to eliminate costly decontamination procedures in the field.

Steam cleaning is used for large machinery, vehicles, auger flights, and coring tools used in borehole sampling. Decontamination fluids, including steam-cleaning fluids, are considered wastes and must be collected and contained for proper disposal. The effectiveness of the decontamination process ~~is~~ may be documented ~~through~~ by rinsate blanks submitted for laboratory analysis. This equipment rinsate blank collection/analysis is no longer required unless poor decontamination effectiveness is anticipated.

2.11 Waste Management

Wastes produced during sampling activities may include borehole auger cuttings, excess samples, excavated soil from trenching, decontamination and steam-cleaning fluids, and disposable materials such as wipes, protective clothing, and sample bottles. Hazardous waste, low-level radioactive waste, transuranic waste, and mixed waste (either low-level or transuranic) may be encountered in OU 1114. Requirements for segregating, containing, characterizing, treating, and disposing of each type and category of waste are provided in an administrative procedure (AP), LANL-ER-AP-05.3, R0, Management of Environmental Restoration Program Waste.

3.0 STANDARD SCREENING METHODS

In all Addendum 1 sampling plans, a screening and analysis table has been used to identify certain field operations, sampling requirements for sampling and analysis. The use of such tables is described below using Table D-1 as an example. Methods have been selected in accordance with requirements delineated in the ER Project's Quality Assurance Project Plan (LANL 1995, 1164).

3.1 Samples and Sampling Methods

The two columns on the left side of Table D-1 identify the sampling location and description and the number of sample locations. The next three columns identify the following: depth interval (as appropriate), total number of samples to be taken, and space for recording each sample identification number. Below the sampling location and description are the types and number of quality assurance (QA)/QC samples to be analyzed. The sampling methods or activities identified in the first column are specifically defined below. Sampling methods are described in detail in Section 7.0 of this appendix.

3.1.1 Use of the Standard Screening and Analysis Tables

The screening and analysis tables serve two major purposes. First, they clearly and concisely summarize the details of a sampling plan. They:

- identify sampling locations,
- indicate sampling methods and spatial sampling intervals,
- identify the screening and analysis measurements for each sample detailed in Chapter 5 of Addendum 1,
- explicitly identify the collection and analysis of field quality assurance samples, and
- give a representation of certain options and uncertainties in the plan.

The tables also provide the detail needed to estimate costs associated with the investigation.

3.2 Screening, Surveying, and Analysis Methods

Very precise language, as described below, has been adopted in Addendum 1 to refer to categories of measurements. Table D-2 summarizes instrumentation and methods to be used or designated analytical approaches.

TABLE D-1

EXAMPLE OF SCREENING AND ANALYTICAL REQUIREMENTS FOR SAMPLING PLAN

SAMPLE DESCRIPTION					FIELD SCREEN			LABORATORY ANALYSIS				
								Radionuclides	Organics			Metals
SAMPLING LOCATION DESCRIPTION	NO. OF SAMPLE LOCATIONS	SAMPLE DEPTH (in)	TOTAL NO. OF SAMPLES	SAMPLE I.D. NUMBER	Radiation screening[a]	Organic vapor screening (PID/FID)	Rad van analysis[b]	Isotopic plutonium and uranium, gamma spec., tritium	VOCs (SW 8240)	PCBs (SW 8080)	SVOCs (SW 8270)	Appendix VIII metals (SW 6010, 7000)
Mortandad Canyon												
Depositional area 1	2	0-12	2		2	2	2	2		2	2	2
		s/f[c]	2		2	2	2	2		2	2	2
Depositional area 2	2	0-12	2		2	2	2	2		2	2	2
		s/f[c]	2		2	2	2	2		2	2	2
Depositional area 3	2	0-12	2		2	2	2	2		2	2	2
		s/f[c]	2		2	2	2	2		2	2	2
QC samples[d]												
Field duplicate	1	TBD[e]	1		1	1	1	1	1		1	1
Field collocated	1	TBD	1		1	1	1	1	1		1	1
Rinsate blank	NA[f]	NA	1					1			1	1
Confirmatory samples	2	TBD	2		2	2	2		2[g]			
TOTALS	10		17		16	16	16	15	4	12	15	15

[a]Gross alpha, beta, and gamma using field instrumentation
[b]Gross alpha, beta, and gamma using mobile laboratory instrumentation
[c]s/f = soil/tuff interface (12 in. interval above interface)
[d]QC samples are determined using guidelines outlined in the site specific QAPjP, Annex II, Note 2A of this work plan. Location is determined by the Field Team Leader.
[e]TBD = To be determined in the field
[f]NA = Not applicable
[g]Represents minimum number of confirmatory samples to be submitted for VOCs based on field screening results. Actual number may vary

TABLE D-2

INSTRUMENTATION AND METHODS FOR PROPOSED ANALYTICAL LEVELS

FIELD SURVEY AND SCREENING
Portable Instruments:
Phoswich meter
Field instrument for the detection of low-energy radiation (FIDLER) meter
Geiger-Mueller counter ESP-1 beta/gamma meter ESP-1 alpha meter
MicroR meter
Organic vapor analyzer (OVA)
Photoionization detector
Explosimeter
Oxygen level indicator
Field test/methods/kits:
OVA headspace test
HNU headspace test
Ensys™ PCB immunoassay kits
FIELD ANALYSIS/INSTRUMENTATION
Radiological screening laboratory
Field gas chromatography (GC)/flame ionization detector (FID)
X-ray fluorescence
LABORATORY ANALYSIS/INSTRUMENTATION
EPA protocol for soil, air, and water analysis for semivolatile organic compounds and metals using Los Alamos, off-site, or mobile laboratories typically includes the following instrumentation (EPA 1994, 1222):
Gas chromatography (GC)
Gas chromatography/mass spectrometry (GC/MS)
Inductively coupled plasma-atomic emission spectroscopy (ICP-AES)
Atomic absorption (AA)

1. **Field Surveys** (or surveys). Direct reading or recording instruments are used to scan the land surface to make measurements of *in situ* conditions. Commonly, surveys provide data of lesser precision than more definitive test methods but they can provide results very quickly. The minimal sample preparation involved generally limits surveys to collecting information related to visual observation and surficial contamination, or to contaminants emitting high energy radiation that can pass through the sample matrix to the detector. It also limits radiological and chemical information to gross categories rather than the identification and quantitation of specific contaminants. Gamma radioactivity is a common target of field surveys. Land surveys and borehole logging are also included in this category.

2. **Field Screening** (field sample screening or screening). This is the process by which instruments or observations are applied to samples at the point of collection to measure the presence of contaminants or to determine other properties of the sample. The quality of data provided by screening and the associated level of data review is comparable to survey data, but the ability to identify and quantify specific contaminants or more focused groups of contaminants is improved in some cases. Gross radioactivity (beta/gamma) and organic vapors are common targets of field screening. Lithologic logging of core samples is included in this category. By averaging data from replicate screens, precision comparable to laboratory analyses may be obtained.

3. **Field Analysis** (or field laboratory analysis). This category represents the initial analyses conducted on samples in the field prior to selecting samples for submission to the analytical laboratory. These analyses are conducted to provide information to direct voluntary corrective actions (VCAs) or to direct which samples are submitted for further analysis at the analytical laboratory. Sample preparation is more rigorous than that used for screening analyses, but not as rigorous as that used for laboratory analyses. This allows for collecting information beyond that which can be collected by screening or surveys alone. Field analyses may provide a quality of data that is more stringent than screening or survey data. The level of data review is generally more detailed than the reviews imposed on screening data. Analyses conducted in field radiological trailers and with the field gas chromatography (GC)/flame ionization detector (FID) are included in this category.

4. **Laboratory Analysis** (or analytical laboratory analyses). This category represents the primary analysis for which samples are collected. Because the data are generated in a highly controlled environment, the opportunity for generating data of incontestable quality is generally considered to be greater than screening, survey, or field analytical data. Of all data types, the level of quality control and data scrutiny is typically greatest for laboratory analyses. Laboratory

analyses are commonly provided by off-site analytical laboratories but may be provided by Los Alamos National Laboratory (LANL) analytical groups, especially in the case of highly radioactive samples and samples requiring very rapid turnaround.

For each of the sampling categories in Table D-1, several measurement techniques are identified by vertical columns. The individual measurement techniques represented by each vertical column are identified in the following sections of this appendix: Section 4.0, Field Surveys and Screening; Section 5.0, Field Analyses; and Section 6.0, Laboratory Analyses.

4.0 FIELD SURVEYS AND SCREENING

Field surveys are primarily walking scans of the land surface using direct reading or recording instruments. Field survey data and screening data (for example, radioactivity or organic vapor measurements) are used to identify the presence of contaminants or structures in the field. While negative results from field surveys are not conclusive evidence of COPCs below trigger levels, positive results obtained at an early stage can allow timely redirection of a sampling plan. For convenience, land surveys to identify and mark locations from old drawings are included in this category.

4.1 Field Surveys

4.1.1 Radiological Surveys

Radiological surveys are conducted to identify the presence of radioactive contamination at a site. Several instruments are suitable for these surveys: microR meters, sodium iodide (NaI) detectors of various sizes with ratemeters and scalers, Geiger-Mueller detectors (such as the ESP-1 beta/gamma meter), field instrument for detection of low-energy radiation (FIDLER), and Phoswich. The specific uses of each meter are discussed in the following subsections.

4.1.1.1 Gross Gamma Surveys

Several instruments are suitable for gross gamma surveys, including microR meters, NaI detectors of various sizes with ratemeters or scalers, and Geiger-Mueller detectors. The preferred instruments are microR meters with the ability to measure to 5 µR/hr, 2-in.-by-2-in. NaI detectors with a ratemeter capable of displaying 100 counts per minute (cpm), and the ESP-1 beta/gamma meter. Some discrete- or continuous-measurement recording instruments are also available using the same detectors. Surveys are conducted by carrying the instrument at waist height, walking at a slow pace, and observing and recording the ratemeter response. Measurements may also be made at the ground surface to aid in verifying the presence of localized radioactive contamination.

4.1.1.2 Low-Energy Gamma Surveys

Either the FIDLER or the Phoswich detector may be used for low-energy gamma surveys. Both are optimized for the detection of low-energy gamma photons, such as the 60 keV gamma emission from americium-241 or x-rays that accompany the decay of heavy radionuclides such as uranium, thorium, plutonium, and other transuranic radionuclides. Discrete- or continuous-measurement recording options are available. Surveys are conducted by carrying the instrument close to (i.e., within 12 inches of) the ground surface and observing the ratemeter or scaler. Measurements may also be made at the ground surface to aid in verifying the presence of localized contamination.

4.1.2 Organic Vapor Surveys

Organic vapor detectors will be used to monitor breathing zones for personnel safety in sample collection and handling areas at OU 1114 sites. Two types of detectors, a photoionization detector (PID) and a flame ionization detector, will be used to survey a wide range of organic vapors as described below.

4.1.2.1 Photoionization Detectors

A Model PI 101 PID or its equivalent will be used. This is a general survey instrument capable of detecting real-time concentrations of many complex organic compounds and some inorganic compounds in air. The instrument can be calibrated to a particular compound; however, it cannot distinguish among detectable compounds in a mixture of detectable gases.

4.1.2.2 Flame Ionization Detectors

A Foxboro Model OVA-128 FID or its equivalent will be used. An FID can be used as a general screening instrument to detect the presence of many organic vapors. Its response to an unknown sample is relative to its response to a gas of known composition to which the instrument has been calibrated. Its quantitative usefulness is, therefore, limited by the comparability of the sample gas to the calibration gas.

4.1.3 Combustible Gas/Oxygen Detector

A Gastech Model 1314 or its equivalent will be used to determine the potential for combustion or explosion of unknown atmospheres during drilling and intrusive activities. A typical combustible gas indicator (CGI) determines the level of organic vapors and gases present in an atmosphere as a percentage of the lower explosive limit or lower flammability limit. The Gastech Model 1314 also contains an oxygen detector to identify atmospheres that are deficient or enriched in oxygen. For health and safety purposes, the CGI will be used (if appropriate) to monitor atmospheres during some intrusive activities.

4.1.4 Land Surveys

Land surveys will be used both to document all sampling locations and, if needed, to locate former or buried structures. In all cases, the documentation requirements for the surveys are plus or minus 1 ft horizontal and plus or minus 0.1 ft vertical. The survey procedure used is LANL-ER-SOP-03.01, R1, Land Surveying Procedures.

4.1.5 Geomorphic Mapping

Field or geomorphic mapping is required to assist in locating certain sampling points. To sample drainages judged most likely to contain potential contamination, some individual sampling plans in Chapter 5 require the identification of watercourses or drainages. Preliminary fieldwork at OU 1114 indicates that an expert field geologist is required to map current-day precipitation runoff channels. The geologist will correlate current-day drainage channels to the historic channels that would have carried effluent from OU 1114 outfall locations into the lower gradient area at the floor of the canyon. To assist in correlating current drainage channels to historic drainage channels, the geologist will use field mapping, aerial photographs, topographic maps, and other archival information. The ER Project's QAPP contains requirements concerning the use of archived data (LANL 1995, 1164).

Several PRS aggregate drainages and channels are well defined from the rim to the floor of the canyon. Other aggregates will require mapping as described above. Professional judgment allows placing representative sampling locations or establishing placement of a systematic sampling grid on field maps. Representative sampling locations must provide adequate coverage to assess dissemination of potential contaminants in the drainages. Correct use of well-documented judgmental sampling points will allow less reliance on nonjudgmental or random sampling regimens.

4.2 Field Screening

Screening measurements are applied at the point of sample collection, in borehole headspace, and in excavations to identify gross contamination and to assess conditions affecting the health or safety of field personnel. Field screening for personnel health and safety is detailed in Annex III of this work plan and the Health and Safety Plan, Chapter 6 in the IWP (LANL 1993, 1090; 1995, 1164). Individual sampling plans may not explicitly identify the use or role of sample screening measurements; however, the standard analytical table for each investigation shall show the methods to be used.

4.2.1 Radiological Screening

Radiological screening is conducted to identify the presence of gross radioactive contamination of samples and personnel. Several instruments are suitable for these surveys including microR meters, NaI detectors of various sizes with ratemeters and scalers, Geiger-Mueller detectors, and alpha scintillation detectors. The specific uses of each meter are discussed in the following subsections.

4.2.1.1 Gross-Gamma Radiological Screening

Field screening samples for gross-gamma radioactivity will be done using a hand-held NaI detector probe and ratemeter or the ESP-1 beta/gamma meter. The NaI detector is held close to the sample or core and is capable of identifying elevated concentrations of certain radionuclides as an increased reading above instrument background levels. The response is best interpreted as a gross indicator of potential contamination.

4.2.1.2 Gross-Alpha Radiological Screening

Field screening samples for gross-alpha radioactivity is conducted using a hand-held alpha scintillation detector and a ratemeter. The detector is held close to contact with the sample or core and is capable of detecting alpha radioactivity on the order of 100 to 200 pCi/g for a damp soil sample. However, detecting alpha activity can be difficult in moist samples because of shielding by the water. The instrument cannot identify specific radionuclides.

4.2.1.3 Gross-Beta Radiological Screening

Field screening of samples for gross-beta radioactivity is accomplished using a hand-held detector. A typical beta detector consists of a Geiger-Mueller tube with a thin mica window protected by a sturdy wire screen. When held close to contact with the sample, the detector (with window thickness between 1.4 to 2 mg/cm^2) is capable of detecting gross beta activity down to energies of 40 keV. The gamma sensitivity of such a detector is approximately 3 600 cpm/mR/h. The beta efficiency (determined as percentage of 2π emission rate, from a 1-in.-diameter source) with screen in place is nominally 45% for strontium-90 and 10% for carbon-14. Screen removal increases efficiency by 45%. This beta detector is alpha sensitive above 3 MeV.

4.2.2 Organic Vapor Detectors

Organic vapor detectors will be used to screen borehole cores and soil samples at the point of collection to identify grossly contaminated samples. PIDs and FIDs (described in Subsection 4.1.2 of this appendix) will be used to improve the probability of detecting a wide range of vapors.

4.2.3 Polychlorinated Biphenyls

Portable enzyme-linked immunosorbent assay kits such as PCB-RISc kits will be used to identify areas of polychlorinated biphenyl (PCB) contamination in the field. Manufacturer's instructions and the draft SW-846 Method 4020 will be followed in using these kits (EPA 1994, 1222). The method is designed to provide indication of PCB contamination above 5 ppm. When necessary, selected confirmation samples for laboratory analysis will be collected from areas to confirm the results of the PCB screening kits.

4.2.4 Lithologic Logging

Lithologic logging of drill cores to describe the physical nature of borehole cores will be performed by a geologist capable of describing subsurface lithologies and differentiating the various strata of Bandelier Tuff.

5.0 FIELD ANALYSES

Section 3.0 of this appendix defines field analyses used in this work plan. These analyses will be used to identify areas of contamination, to select samples for confirmation by laboratory analysis, and to provide preliminary and final radiological and chemical analyses of samples. The radiological analyses will be conducted using the mobile radiological analysis laboratory in accordance with Inorganic Trace Analysis Group (CST-9) procedures series MRL100 through MRL400. In addition, the mobile chemistry van will be used to provide chemical analyses. Mobile radiochemical and chemical analyses will be conducted either onsite or at an easily accessible location, following the analyses described in Subsections 5.1 and 5.3. At the discretion of the field project leader (FPL) and mobile laboratory personnel, experimental conditions may be adjusted to provide the necessary analytical sensitivity, selectivity, precision, and bias. For example, counting times for radiological analyses may be adjusted to provide required sensitivities while maintaining acceptable turnaround times. The field analyses will be conducted using field GC/FID, as described in Subsection 5.2 and x-ray fluorescence, described in Subsection 5.3.

5.1 Field Radiological Analyses

For areas with suspected radiological contamination, an accurate estimate of sample radioactivity is required before the samples can be submitted to the SCF. The CST-9 radiological analysis van will be used to conduct preliminary radiological analyses to ensure samples fall within Department of Transportation (DOT) shipping limits. Results of these analyses will also be used to identify areas of radiological contamination, indicate which radioelements are likely present, and provide definitive analyses where appropriate. Use of the mobile radiological analyses ~~laboratory~~ van will minimize sample turnaround times that may contribute to sampling decisions in the field and ultimately translate to reduced costs. The decision to use the mobile radiological analysis van or to send samples to fixed laboratories rests with the FPL but may be delegated as necessary. Field radiological analyses are discussed in the following subsections.

5.1.1 Gross-Alpha and Gross-Beta Radioactivity

Measurements of gross-alpha and gross-beta radioactivity can be used to assess the presence of plutonium, uranium, and americium in samples; although individual radionuclides cannot be identified by this method. Despite limitations regarding analyte selectivity, these measurements can be used to guide field operations, bias sample selection, or provide an initial assessment of the sample radioactivity for health and safety purposes.

The method uses dried soil samples in a fixed geometry with measurement times of 15 to 20 minutes. Detection limits are approximately 60 pCi/g for alpha emitters and 20 pCi/g for beta emitters.

5.1.2 Gamma Spectrometry

Gamma spectrometry can be used to quantify gamma-emitting radionuclides in soil samples by determining the intensities of gamma photons emitted over a range of energies. Dried soil samples are counted in a fixed geometry using computer-based multichannel analyzers equipped with NaI or germanium detectors. Detection limits are isotope specific.

5.2 Field GC/FID

Field GC/FID analyses will be used to identify areas with hydrocarbon contamination; for example, to identify the extent of areas to be excavated during VCAs. An adaptation of SW-846 Method 8015 or Method 418.1 for total petroleum hydrocarbons (TPH) will be used and confirmatory samples will be sent for fixed laboratory analysis to verify that petroleum

contamination has been remediated. The field method, sensitive below the proposed 100 ppm cleanup levels, can be standardized against various petroleum products (for example, Stoddard solvent or diesel fuel) or site-specific materials (for example, spilled petroleum products that have weathered).

5.3 Mobile Chemistry Analyses

To the extent practicable, the mobile chemistry van will be used for polychlorinated biphenyls, TPH, semivolatile organics, and volatile organics analyses. The Organic Analysis Group's (CST-12) procedures series MLO274 through MLO720 will be used for these analyses. The intent is to minimize turnaround times, sample handling, and analyses costs; yet provide data at a level of analyses appropriate for making future sampling and cleanup decisions. The mobile chemistry analytical procedures are based on standard Environmental Protection Agency (EPA) analytical protocols.

5.3.1 X-ray Fluorescence Probe for Metals

Metal concentrations in solid matrices may be determined using x-ray fluorescence (XRF) spectroscopy. Instrumentation consists of a source for sample excitation (x-ray tube or radioisotope), a solid-state proportional counter or detector, a sample chamber, and an energy analyzer. Dried soil or crushed debris samples are placed in a sample chamber, excited, and counted for finite time periods (e.g., 400 seconds).

Metal action-level detection limits may not be achieved in field instruments, but gross concentrations of metals may be detected. Even gross concentrations of metals will provide valuable information for soil or debris assessment. An ER SOP for XRF analyses is currently in technical review. The field team will follow guidance from the XRF SOP if it is approved before sampling begins. Otherwise, calibration and field procedures recommended by the instrument manufacturer will be followed.

6.0 LABORATORY ANALYSES

Subsection 3.2 of this appendix provides the definition of laboratory analyses as it is used in Addendum 1. Data generated in fixed laboratories are intended to be of the highest quality. Samples submitted to an analytical laboratory will be packaged, shipped, and tracked by the ER Project's Sample Coordination Facility.

Table D-3 summarizes analytical methods used for sample analyses. The following list clarifies a few of the analytical methods that appear in Table D-3.

TABLE D-3

SUMMARY OF ANALYTICAL METHODS USED FOR ANALYSES OF SAMPLES COLLECTED AT OU 1114

SAMPLE TYPE	METHOD USED	METHOD DETECTION/ QUANTITATION LIMIT IN SOILS
Radionuclides		
Gross alpha	Gas flow proportional counter	4.0-10.0 pCi/g [a]
Gross beta	Gas flow proportional counter	5.0-12.0 pCi/g [a]
Gamma spectrometry	High-purity germanium gamma-ray spectrometry	0.1-2.0 pCi/g [a]
Isotopic plutonium (plutonium-238, -239, -240)	Ion exchange and alpha spectrometry	0.02 pCi/sample [b]
Isotopic uranium (uranium-234, -235, -238)	Ion exchange and alpha spectrometry	3.00 pCi/g [b]
Strontium-90	Solvent extraction and beta counting	0.50 pCi/g [b]
Tritium	Distillation and liquid scintillation	2.50 pCi/total activity, or 500 pCi/L per 5 ml sample[b]
Organics		
Herbicides	EPA SW-846 Method 8150	0.05-167.0 ppm [c]
Organochlorine pesticides	EPA SW-846 Method 8080	0.0014-0.16 ppm [c]
Organophosphorus pesticides	EPA SW-846 Method 8140	0.02-3.35 ppm [c]
Polychlorinated biphenyls	EPA SW-846 Method 8080	0.045 ppm [c]
PCB/immunoassay	EPA SW-846 Method 4020 [c]	5.0 ppm [c]
Semivolatile organic compounds	EPA SW-846 Method 8270	0.10-3.30 ppm [c]
Total petroleum hydrocarbons	EPA Method 418.1[c]	10 ppm[c]
Volatile organic compounds	EPA SW-846 Method 8240	0.005-0.10 ppm [c]
Metals		
Mercury	EPA SW-846 Method 7471	0.2 ppm [d]
OU 1114 and Subpart S metals suite (arsenic, barium, beryllium, cadmium, chromium, lead, nickel, selenium, silver), Appendix VIII or TAL metals suite	EPA SW-846 Method 6010 [c]	See Table D-4
Appendix VIII or TAL metals suite	EPA SW-846 Method 7000 [c]	See Table D-4
Miscellaneous		
Cyanide	EPA SW-846 Methods 9010 and 9012[a]	1.0 ppm [e]

[a] DOE 1983, 0516.
[b] LANL 1992, 0520.
[c] EPA 1994, 1222.
[d] A dilution factor of 100 was applied to the detection limit reported.
[e] EPA 1991, 0814.

- **Gross alpha/beta/gamma.** This refers to the laboratory analysis for the total activity of the sample for each of these types of radiation.

- **Isotopic analyses.** The following isotopic analyses may be selected based on the gross alpha/beta/gamma analyses done in the radiological van.

- **Gamma spectroscopy.** This refers to quantification of individual radionuclides by measurement of photon emissions over a range of energies.

- **Isotopic plutonium.** Radiochemical separation of plutonium from soil is followed by alpha spectrometry to quantify each isotope of plutonium.

- **Isotopic uranium.** Radiochemical separation of uranium from soil is followed by alpha spectrometry to quantify each isotope of uranium.

- **Strontium-90.** This refers to radiochemical separation using multiple selective precipitation and counting beta activity by gas proportional detectors.

- **Tritium.** This refers to measurement of tritium in soil moisture. Soil moisture is distilled from soil, and the low-energy beta emission from tritium is measured by liquid scintillation techniques.

- **Appendix VIII Metals Suite.** The 40 CFR Appendix VIII metals suite or the target analyte list (TAL) metals will be used as the default list of metals where no subset has been specified for analysis. At OU 1114 there is no documented use of several metals on the Appendix VIII or TAL metals list (including antimony, arsenic, barium, selenium, thallium, and vanadium). For several metals on the Appendix VIII list (including aluminum, cobalt, iron, manganese, and zinc), the screening action levels (SALs) are far higher than any waste concentrations expected at the site, or are such common constituents in the environment that no SALs have been defined for soil. Table D-4 compares the TAL metals list and the OU 1114 Appendix VIII default suite to the SAL in soil.

- **Mercury** (SW-846 Methods 7470, 7471). Method 7470 is the standard EPA method for quantification of mercury in aqueous waste and groundwater. Method 7471 is the EPA method for quantification of mercury in solid and sludge-type waste.

- **Cyanide** (SW-846 Methods 9010, 9012). Methods 9010 and 9012 are the standard EPA methods for quantification of cyanide in an aqueous waste or leachate.

TABLE D-4

ANALYTE LISTS COMPARED

TARGET ANALYTE LIST (TAL)	OU 1114 ANALYTE LIST (APPENDIX VIII LIST)	SAL IN SOIL[a] (mg/kg)
Aluminum		b
Antimony	Antimony	32.00
Arsenic	Arsenic	b
Barium	Barium	5 600.00
Beryllium	Beryllium [c]	b
Cadmium	Cadmium [c]	80.00
Calcium	Calcium	b
Chromium III	Chromium III	80 000.00
Chromium VI	Chromium VI [c]	400.00
Cobalt		b
Copper		3 000.00
Cyanide		1 600.00
Iron		b
Lead	Lead [c]	400.00 [d]
Magnesium		b
Manganese		11 000.00
Mercury	Mercury [c]	24.00
Nickel	Nickel [c]	1 600.00
Potassium		b
Selenium	Selenium	400.00
Silver	Silver [c]	400.00
Sodium		b
Thallium	Thallium	6.40
Uranium		240.00
Vanadium	Vanadium	560.00
Zinc		24 000.00

[a] Soil SALs (except SAL for ~~cadmium~~ lead) are from the 1993 IWP (LANL 1993, 1017)

[b] Background comparison should be performed for this compound to determine if further action is required.

[c] These metals constitute the OU 1114 metals suite. Analysis for the remaining metals will only occur at the waste water treatment system aggregate and the Sigma Mesa solar pond.

[d] Soil SAL based on EPA OSWER Directive 9355.4-12 (EPA 1994, ~~1222~~). 1209

7.0 SAMPLING METHODS

7.1 Introduction

For the field sampling plans in Addendum 1, specific sampling methods have been selected and the details of their uses and applications in the field have been carefully defined below. In addition to consistency of operations and minimization of repeated information, this standardization provides comparability of sample analysis results from location to location in OU 1114.

For each method identified below the specifically defined portion is detailed; however, complete specification of the method requires additional information that is referenced to the applicable SOP or provided in the field sampling plan (e.g., nominal or target depth for a borehole).

7.2 Soil Sampling Methods

7.2.1 Surface Soil Samples

Surface soil samples are defined as samples taken from the upper 12 in. of soil. This type of soil sample shall be gathered using a stainless steel or Teflon™ scoop. Care must be used to take the sample to a full 12-in. depth and to cut the sides of the hole vertically so that equal volumes of soil are taken from sample to sample over the full 12-in. depth. The applicable SOPs are LANL-ER-SOP-06.09, R0, Spade and Scoop Method for Collection of Soil Samples and LANL-ER-SOP-06.10, R0, Hand Auger and Thin-Wall Tube Sampler.

7.2.2 Undisturbed Surface Soil Samples

Undisturbed soil samples shall be gathered from the first six inches of soil using the ring sampler method. This method involves driving a four-inch-diameter stainless steel tube (ring sampler) vertically into the area to be sampled. The soil around the ring sampler is then excavated so that the tube can be removed. An undisturbed core sample is obtained by pushing the soil from the ring sampler. The applicable SOP is LANL-ER-SOP-06.11, R0, Stainless Steel Surface Soil Sampler.

7.2.3 Deposition-Layer Soil Samples

Deposition-layer soil samples are collected from the first one inch of soil. Samples collected using this method represent wind- or air-deposited contaminants on the soil surface (e.g., contaminants dispersed and deposited from stack emissions). They shall be collected by using a stainless steel or Teflon™ trowel to scrape off the upper one inch of soil. The applicable SOP is LANL-ER-SOP-06.09, R0, Spade and Scoop Method for Collection of Soil Samples.

7.2.4 Manual Shallow-Core Samples

Small volume soil samples can be recovered from depths approaching 10 ft with a hand auger or with a thin-wall tube sampler. The thin-wall tube sampler provides a less disturbed sample than that obtained with a hand auger. However, it may not be possible to force the thin-wall tube sampler through some soil or tuff, and sampling with the hand auger may be the more viable alternative. The applicable SOP is LANL-ER-SOP-06.10, R0, Hand Auger and Thin-Wall Tube Sampler.

7.3 Chip Samples

Chip samples are destructive samples collected to be representative of porous surfaces such as asphalt, concrete, wood, brick, unglazed clay pipe, and tuff. Destructive porous surface techniques are used for any porous object considered too large for collection, such as a discrete sample. Examples include intact structures such as a roadbed or wall, chunks of debris too large for transport, boulders or bedrock surfaces, and surfaces of functioning structures. Chip sampling requires a chisel, drill, hole saw, or similar tool to collect a minimum of 100 grams of sample to a maximum depth of 1 in. The applicable SOP is LANL-ER-SOP-06.28, R0, Chip Sampling of Porous Surfaces.

Trenches may be used to evaluate geologic features such as soils or stratigraphy. The minimum trench dimensions sufficient to expose significant geologic materials and relationships on the trench wall are generally 5 to 12 ft deep by 3 ft wide. The actual dimensions may vary depending on site and geologic conditions and available equipment. Trenching will also vary considerably depending on topography, ease of excavation, and available equipment. Soil samples will be collected from the backhoe bucket using the LANL-ER-SOP-06.09, R0, Spade and Scoop Method for Collection of Soil Samples to preclude the need for a confined space entry permit.

7.4 Liquid Samples

The Coliwasa sampler is designed for collecting liquid hazardous wastes. It permits the representative sampling of multiphase wastes with a wide range of viscosity, corrosivity, volatility, and solids content. The main parts of the Coliwasa consist of a sampling tube, stop-cock, and closure system. The sampling tube is a 5-ft by 1.625-in.-diameter translucent plastic pipe (usually polyvinyl chloride), or a borosilicate glass plumbing tube. The plastic Coliwasa is used to sample most containerized liquid wastes except wastes that contain ketones, nitrobenzene, dimethylforamide, mesityl oxide, and tetrahydrofuran. The glass Coliwasa is used to sample all other containerized liquid wastes except for strong alkali and hydrofluoric acid solutions. The applicable SOP is LANL-ER-SOP-06.15, R0, Coliwasa Sampler for Liquids and Slurries.

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← EPA 1994, 1209

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LANL (Los Alamos National Laboratory), July 1993. "RFI Work Plan for Operable Unit 1114," Los Alamos National Laboratory Report LA-UR-93-1000, Los Alamos, New Mexico. **(LANL 1993, 1090)**

← LANL 1995, 1164

Executive Summary

Chapter 1
Introduction

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Evaluation of Potential Release Site Aggregates

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Appendices

Annex II

Quality Assurance Project Plan

RFI Work Plan (1993)

- Approval for Implementation
- Project Organization and Responsibility
- Quality Control Samples
- Sample Representativeness
- Field Quality Assurance Reports to Management

Addendum 1) Note 2A:

- Supplement to Quality Control Samples

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NOTE 2A: SUPPLEMENT TO QUALITY CONTROL SAMPLES

1.0 INTRODUCTION TO QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Note 2A is a supplement to Annex II, Note 2 of the RFI Work Plan for Operable Unit (OU) 1114 (LANL 1993, 1090). It uses available quality assurance/quality control (QA/QC) sample data from the 1994 summer sampling season, extracted from the Facility for Information Management and Display (FIMAD) between February 13 and February 17, 1995, to determine which QA/QC samples give the most value-added information. Those data were analyzed to determine: what QA/QC samples would yield the most useful information for OU 1114 and how many QA/QC samples should be proposed in Addendum 1 to the RFI Work Plan for OU 1114.

Note that the recommendations in this supplement were followed in the Addendum 1, Chapter 5 sampling plans. In one case, the Field Unit One (OU 1114 is now in Field Unit 1) technical team recommended that no spiked samples be submitted as described in Section 4.0. However, the recommendation does not preclude any contractual agreements between the contract laboratories and Los Alamos National Laboratory's (LANL's) Analytical Services Group, CST-3, for supplying spiked samples if required.

2.0 BLANK SAMPLES

Blank samples are used to detect and estimate positive analyte biases incurred through sample collection, handling, and analyses. To determine the number of blank samples that should be taken to maintain adequate quality control and assessment over field activities, data for the 1994 summer sampling season were reviewed. Of 2 933 analyte determinations performed on 25 blanks at OU 1114, the 5 analytes listed in Table 1 were detected. These five analytes are chloroform, copper, iron, lead, and zinc. ✓ Insert Table 1

Eight instances of detection occurred for the four metals in five samples. Chloroform was detected in seven other blank samples, but in none of the field samples. All totaled, 15 analyte detections were registered out of 2 933 determinations, or a 0.5% analyte detection rate. All analytes detected in the blanks were detected at concentrations within a factor of approximately three times their respective estimated quantitation limits (EQLs) or estimated detection limits (EDLs) (EPA 1992, 1207).

An EQL is the limit representing the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operations. The EQL is

generally 5 to 10 times the method detection limit but, to simplify data reporting, it may be a nominal value chosen within these guidelines. The EQL may be the concentration that is the lowest non-zero concentration standard used to generate the analytical calibration curve. EQLs may not always be achievable.

An EDL is the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix type containing the analyte. The contaminant detection rate in the blanks is low and the respective contaminant concentrations are very low relative to screening action levels (SALs). Given this, the following approach for computing the number of field QC blanks to be collected in the future is recommended.

Assume that a 10% analyte detection rate can be tolerated because historically, when an analyte is detected, its concentration is such that it is much less than its SAL. Also assume that the detection of one analyte is not correlated with detection of another analyte and that the distribution of detection rates in the contaminated blanks is Gaussian. With a 95% confidence level of detecting contamination, this equates to a mean value of a 5% detection rate with a standard error of the mean equal to 2.5%. Thus, 0.05 represents P, the mean proportion of analytes detected and 0.025 represents the standard error of the mean. Barnett's equation relating the distribution of analyte detection rate to the number of samples required to detect P with a given level of confidence is:

$$SE(P) = \sqrt{\frac{P(1-P)}{n}}$$

Where P is defined above, $SE(P)$ is the standard error of P, and n = the number of samples required to yield the desired confidence in detecting contamination at the accepted rate (Barnett 1974, 17-1218). This equation rearranges to:

$$n = \frac{P(1-P)}{[SE(P)]^2}$$

and allows for easily computing n.

With $P = 0.05$ and $SE(P) = 0.025$ a value of $n = 76$ is computed. Because each volatile organic analysis includes the determination of 60 analytes, $n = 76$ translates to two trip blank samples (n = 76/60 => 2 samples) for detecting volatile organic contamination. Using similar logic, and an assumption of 23 analytes included in a typical metals analysis suite, a total of four equipment rinsate blanks is computed (n = 76/23 => 4 samples) for detecting metals contamination.

The Field Unit One technical team recommended that field reagent blanks be eliminated from the QA/QC sample scheme. Although two field reagent blanks showed chloroform contamination, the chloroform detected could be due to laboratory contamination (no chloroform was detected in actual field samples) and the detected contamination is within a factor of 1.5 of the EQL. In addition, no volatile organics were detected in the duplicate and collocated samples. This, in conjunction with the fact that equipment rinsate blanks should include any contaminants likely to show up in field reagent blanks, is the rationale for eliminating field reagent blanks from the QA sample scheme.

No radioactive contaminants were detected in the blank samples at activities statistically greater than zero. Because radionuclides were detected in the environmental samples but not the blank samples, implementation of field sampling and decontamination protocol is assumed to be adequate. This is corroborated by the fact that metals and organic contaminants are present at concentrations approximately two to three orders of magnitude less than concentrations of interest for screening, i.e., SALs. Such low contaminant concentrations are dwarfed by the imprecision associated with sampling and analyses.

Radionuclide contaminants have not been a problem in the blanks, so there is probably no need to monitor blanks for radionuclide contamination. This field season there is a greater expectation than in the 1994 field season that organic contaminants will be present in potential release sites (PRSs); therefore, monitoring should be done for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) concentrations. Also, as metals have been the most frequently observed constituents of concern (COCs), they too should be monitored. Audits of field personnel compliance with sample collection and equipment decontamination procedures, together with the following QC sample schedule in Table 2, is also recommended. Insert Table 2

If metal contamination is detected in blanks, one should suspect that if radionuclides are present in the environmental samples, radionuclides are also possible contaminants. Judicious use of the chemistry van for monitoring metals contaminants using, for example, laser-induced breakdown spectroscopy (LIBS) might provide near screening for metals contaminants. A possible alternative is to have CST-9 dedicate a particular instrument in their laboratory (either wholly or partially) to rapid turnaround of such samples for metals analyses. This would require advance coordination with CST-3 prior to sending the quick turnaround samples to them. Hand-held screening or use of the radiochemistry van for real time or near real time screening of samples for radioactivity might also be an option. The chemistry van should be considered for use in near real time analysis of blanks and environmental samples for organic contaminants.

3.0 ESTIMATION OF SAMPLING ERROR AND POPULATION VARIABILITY

Collocated samples provide information on the repeatability of sampling (sampling error) and on very small-scale COC concentration distributions (population variability); duplicate samples provide information on larger scale distribution of COC concentrations. The component of sampling error obtained through the use of field splits is contained within collocated and duplicate field samples. Therefore, it is recommended that field splits not be taken, but that a series of collocated samples be taken to estimate small-scale population variance and field duplicates be taken to gain an estimate of population variance on a wider scale.

Total variability for all sample data for inorganic analyses was 82% risk-specific dose (RSD) (OU 1114 data extracted from FIMAD between February 13 and February 17, 1995). This is marginally greater than 73% RSD, which is the maximum observed for collocated and field split samples from the same data set. However, from available data, only five pairs of field splits and three pairs of collocated samples were analyzed for metals. Two pairs of collocated samples were analyzed for radionuclides. These low numbers of samples provide little statistical power in the estimate of variances. More statistical power can be obtained by taking more samples. The means of determining an appropriate number of samples to be collected is described below.

Assuming a desired 95% confidence level in the estimate of small-scale and large-scale variances, the number of sample pairs required to yield a range of values containing the true variance can be obtained from Table 3 of *A Rationale for the Assessment of Errors in the Sampling of Soils* (van Ee and Starks 1990, 17-1219). Van Ee's Table 3 shows that, with 10 sample pairs (10 degrees of freedom), the estimated variance has a 95% probability of lying within the range of 0.49 to 3.08 of the true variance. Because the variance is the square of the standard deviation, this can be converted to an estimate of the precision of the standard deviation by taking square roots. Doing so reveals that the estimated standard deviation would have 95% probability of falling within the range of 0.70 to 1.75 times the true standard deviation. Using similar calculations, 20 samples would provide an estimate of sampling standard deviation ranging from 0.76 to 1.44 of the true standard deviation. Thus, doubling the sample size (i.e., a doubling of sampling/analysis cost) provides only about a 30% decrease in the range of values associated with the estimate of sampling error standard deviation. For this reason, it is recommended that the numbers of the indicated samples (Table 3) be collected and analyzed to gain estimates of sampling and population variability. ✓ Insert Table 3

If radionuclides are of concern at a particular PRS, they may be added to the analyte list so that an estimated variability for radionuclide concentrations can be obtained.

4.0 SPIKED SAMPLES

Spiked samples may be used to obtain estimates of variability and bias for analytes that have been spiked (added) into a sample, as well as those that appear naturally in the sample. The variability and bias represent the errors associated with sample handling, storage, and analysis, as well as matrix-specific effects. Thus, ideally, the sample that is spiked has a matrix identical to that of the environmental samples of interest. This cannot be commonly achieved and a sample matrix that approximates the environmental sample matrix is actually spiked.

Data available to date indicate that a single, spiked water sample was analyzed at OU 1114 during the 1994 summer sampling season. However, field spikes of water do not represent soil sample collection and analyses because of the great differences between soil and water matrices. Therefore, it is recommended that field spikes be eliminated from the QA sample scheme. In addition, the surrogate standard addition to and matrix spiking of soil samples that are part of existing laboratory protocol, provide better indicators of analyte recovery in soils than spiked water samples.

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Please format Tables 1, 2, 3 correctly

TABLE 1

ANALYTES DETECTED IN TWENTY-FIVE BLANK SAMPLES

ANALYTE	NUMBER OF DETECTS	DETECTION RANGE	EQL[a] OR EDL[b]	SAL[c]
Chloroform	7	6 to 9 µg/L	5 µg/L (EQL)	210 µg/kg
Copper	2	30 to 34 µg/L	25 µg/L (EDL)	3 000 mg/kg
Iron	2	125 to 227 µg/L	100 µg/L (EDL)	NA[d]
Lead	2	4.4 to 5.8 µg/L	3 µg/L (EDL)	500 mg/kg
Zinc	2	26 to 68.3 µg/L	20 µg/L (EDL)	24 000 mg/kg

[a]EQL = Estimated quantitation limit.

[b]EDL = Estimated detection limit.

[c]SAL = Screening action level

[d]NA = Not applicable

TABLE 2

RECOMMENDED NUMBER OF BLANK SAMPLES

QC SAMPLE	NUMBER TO BE COLLECTED (ADDENDUM 1)	ANALYSES PERFORMED
Equipment rinsate blank	4	Metals, VOAs
Trip blank	2	Metals, VOAs

TABLE 3

RECOMMENDED NUMBER OF COLLOCATED AND FIELD DUPLICATE SAMPLES

QC SAMPLE	NUMBER TO BE COLLECTED (ADDENDUM 1)	ANALYSES PERFORMED
Collocated sample	10	Metals, VOAs, SVOAs
Field duplicate	10	Metals, VOAs, SVOAs

1.0 APPROVAL FOR IMPLEMENTATION

06-01-95

Lynda,
This page is from the 1993 Annex II. It was not included with the Addendum 1 Annex II. Your author has renumbered Annex II with 1.0 as the introduction. The second paragraph of the introduction explains how the OU 1114 Annex II relates to the generic QAPjP. In light of this, I wonder if we should include only the new text as an attachment to Annex II. What do you want to do?

M. [illegible]

1. NAME: Robert Vocke
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1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPjP) for the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1114 was written as a matrix report (Table II-1) that is based on the Los Alamos National Laboratory (the Laboratory) Environmental Restoration (ER) Program's generic Quality Assurance Project Plan. The generic QAPjP is Appendix T in the Installation Work Plan (IWP) (LANL 1991, 0553).

The Laboratory ER Program generic QAPjP describes the format for the individual OU QAPjPs. In the generic QAPjP, Section 1.0 is the Approval For Implementation, which is included in the front of this annex. Section 2.0 of the generic QAPjP is the Table of Contents, which was omitted from this annex because the OU 1114 QAPjP is presented as a matrix. Section 3.0 of the generic QAPjP is the Project Description, and Subsection 3.1 is the Introduction. This introduction will serve as the equivalent of Subsection 3.1 and the matrix (Table II-1) will begin with Subsection 3.2, Facility Description.

The OU 1114 QAPjP matrix (Table II-1) lists the generic QAPjP criteria in the first column; these criteria correspond to the sections of the generic QAPjP. The second column lists the specific requirements of the generic QAPjP that the OU 1114 QAPjP must meet; the subsection titles and numbers in the second column correspond directly with those contained in generic QAPjP. Sections of the generic QAPjP that do not contain specific requirements are not included in the matrix, e.g., 3.4. The third column lists the location in the IWP and/or the OU 1114 Work Plan of information that fulfills the requirements in the generic QAPjP. If OU 1114 will follow the requirements in the generic QAPjP and no further information is necessary, the column contains the phrase "generic QAPjP accepted." In some cases, a standard operating procedure (SOP) and/or a clarification note is included.

2.0 CLARIFICATION NOTES

2.1 *Note 1:* Section 4.0 Project Organization and Responsibility

The organizational structure of the ER Program is presented in Section 2.0 of the LANL ER Quality Program Plan (QPP) to the project leader (PL) level, including quality assurance functions. The OU 1114 work plan, Annex I, describes the organizational structure from the PL level down.

Note: Note that Table II-1 begins with 3.2 (explained in paragraph 2)

Changes & addition to this table marked in margin

TABLE II-1

OU 1114 QAPjP MATRIX

GENERIC QAPjP CRITERIA	GENERIC QAPjP REQUIREMENTS BY SUBSECTION	OU 1114 INCORPORATION OF GENERIC QAPjP REQUIREMENTS
Project description	3.2 Facility Description	Los Alamos National Laboratory (LANL) ER Program IWP (LANL 1992, 0768), Chapter 3, and OU 1114 Work Plan, Chapter 2
	3.3 ER Program	LANL ER Program IWP, Subsection 3.2
	3.4.1 Project Objectives	OU 1114 Work Plan, Chapters 1, 5[1], and 6[1]
	3.4.2 Project Schedule	OU 1114 Work Plan, Annex I
	3.4.3 Project Scope	OU 1114 Work Plan, Chapters 1 and 5[1]
	3.4.4 Background Information	OU 1114 Work Plan, Chapters 1, 2, and 3
	3.4.5 Data Management	OU 1114 Work Plan, Annex IV, and LANL ER Program IWP, Annex IV
Project organization	4.1 Line Authority	OU 1114 Work Plan, Annex I
	4.2 Personnel Qualifications, Training, Resumes	Maintained as records within OU 1114 record system
	4.3 Organizational Structure	LANL-ER-QPP, Section 2.0, *Note 1*.
Quality assurance objectives for measurement data in terms of precision, accuracy, representativeness, completeness, and comparability	5.1 Level of Quality Control	Generic QAPjP accepted
	5.2 Precision, Accuracy, and Sensitivity of Analyses	Generic QAPjP accepted
	5.3 QA Objectives for Precision	Generic QAPjP accepted
	5.4 QA Objectives for Accuracy	Generic QAPjP accepted
	5.5 Representativeness, Completeness, and Comparability	Generic QAPjP accepted
	5.6 Field Measurements	Generic QAPjP accepted
	5.7 Data Quality Objectives	OU 1114 Work Plan, Chapter 5[1]
Sampling procedures	6.0 Sampling Procedures	OU 1114 Work Plan, Appendix D[1]
	6.1 Quality Control Samples	Generic QAPjP accepted including ER Program SOP-01.05. See also *Note 2 and Note 2A*.
	6.2 Sample Preservation During Shipment	Generic QAPjP accepted including ER Program SOP-01.02
	6.3 Equipment Decontamination	Generic QAPjP accepted including ER Program SOP-01.06
	6.4 Sample Designation	Generic QAPjP accepted including ER Program SOP-01.04
Sample custody	7.1 Overview	Generic QAPjP accepted including ER Program SOP-01.04
	7.2 Field Documentation	Generic QAPjP accepted including ER Program SOP-01.04
	7.3 Sample Management Facility	Generic QAPjP accepted
	7.4 Laboratory Documentation	Generic QAPjP accepted
	7.5 Sample Handling, Packaging, and Shipping	Generic QAPjP accepted including ER Program SOP-01.03
	7.6 Final Evidence File Documentation	Generic QAPjP accepted
Calibrations procedures and frequency	8.1 Overview	Generic QAPjP accepted
	8.2 Field Equipment	Generic QAPjP accepted
	8.3 Laboratory Equipment	Generic QAPjP accepted

TABLE II-1 (continued)

OU 1114 QAPjP MATRIX

GENERIC QAPjP CRITERIA	GENERIC QAPjP REQUIREMENTS BY SUBSECTION	OU 1114 INCORPORATION OF GENERIC QAPjP REQUIREMENTS
Analytical procedures*	9.1 Overview	Generic QAPjP accepted
	9.2 Field Testing and Screening	Generic QAPjP accepted including ER Program SOP-06.02
	9.3 Laboratory Methods	Generic QAPjP accepted. Sampling plans are described in OU 1114 Work Plan, Chapter 5
Data reduction, validation, and reporting	10.1 Data Reduction	Generic QAPjP accepted
	10.2 Data Validation	Generic QAPjP accepted
	10.3 Data Reporting	Generic QAPjP accepted
Internal quality-controlled checks	11.1 Field Sampling Quality Control Checks	Generic QAPjP accepted
	11.2 Laboratory Analytical Activities	Generic QAPjP accepted
Performance and system audits	12.0 Performance and System Audits	Generic QAPjP accepted
Preventive maintenance	13.1 Field Equipment	Generic QAPjP accepted
	13.2 Laboratory Equipment	Generic QAPjP accepted
Specific routine procedures used to assess data precision, accuracy, representativeness, and completeness	14.1 Precision	Generic QAPjP accepted
	14.2 Accuracy	Generic QAPjP accepted
	14.3 Sample Representativeness	Generic QAPjP accepted See also *Note 3*.
	14.4 Completeness	Generic QAPjP accepted
Corrective action	15.1 Overview	Generic QAPjP accepted including LANL-ER-QP-01.3Q
	15.2 Field Corrective Action	Generic QAPjP accepted
	15.3 Laboratory Corrective Action	Generic QAPjP accepted
Quality assurance reports to management	16.1 Field Quality Assurance Reports to Management	Generic QAPjP accepted. See also *Note 4*.
	16.2 Laboratory Quality Assurance Reports to Management	Generic QAPjP accepted
	16.3 Internal Management Quality Assurance Reports	Generic QAPjP accepted

* Although the generic QAPjP criteria are accepted, special sampling limits, parameters, and analyses will be established for operable unit-specific cases (refer to Appendix D). See the note at the top of page 9-2, Generic QA Project Plan (LANL 1991, 0553).

† Addendum 1 of the 1995 OU 1114 Work Plan.

Footnote #1 added in Addendum 1

2.2 *Note 2:* Section 6.1 Quality Control Samples

Quality assurance (QA) and quality control (QC) sampling for RFI Phase I in OU 1114 will provide samples to address variability in the sampling and analytical procedures. Most of these will be prescribed generically as follows:

- Rinsate samples (in general, one per day) will be collected if on-site decontamination of sampling

equipment is being performed.

- A trip blank (one per sample delivery group) will be included whenever volatile organic compounds are a potential contaminant at the site.

- Field reagent blanks will be submitted only if reagents are brought in bulk to the site and measured out on site.

- The Sample Coordination Facility (SCF) will add blanks, surrogate spikes, and other QA samples to each batch following its standard practices. (Batch sizes will be determined by the SCF and will vary depending on the type of analyses to be performed. The SCF will attempt to keep samples from a sample delivery group together as much as possible when batching samples for the analytical laboratories.)

- The analytical laboratories will report analyses of instrument blanks, calibration standards, and other QC samples as specified in their contracts with the SCF.

- Field instrument calibration checks will be performed as specified in the SOPs controlling the use of those instruments. The results will be recorded in the field documentation of the survey.

- The field laboratories will provide laboratory splits, replicate analyses, and calibration checks as specified by their SOPs or QC programs. The results will be documented and reported to the field team leader daily.

In general, the QA/QC samples listed above are at most single blind samples.

The only types of QA sampling that are described in site-specific detail in Chapter 5 are double blind collocated samples, field splits, and field duplicates to be prepared in the field for both field and off-site laboratories. We define these as follows:

- A collocated sample is a second sample collected next to the first sample, as close as pract 2 ft away), using the same method a spade or scoop sample, another me etc.). In general, subsamples for the are prepared for each proposed ana sample.

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To Tom Johnston	From Margaret Burger	
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- A field split is a second subsample collected in the field from a prepared (e.g., homogenized) sample for a designated type of analysis. This can be appropriate for inorganic, radionuclide, and most semivolatile organic analyses, but in general is not useful for volatile organic analyses.

Please return by COB 06-08-95. Call if you have questions. Thanks. M Burger

- A field duplicate is a second subsample collected for a minimally disturbed field sample (usually a core) for a designated type of analysis. Field duplicates are used in place of field splits for volatile compounds.

Collocated samples provide an estimate of "total study error" (apart from overall population variability, which is captured by taking a number of samples from the site). Field splits and field duplicates are used to estimate incremental error introduced by imperfect homogenization, handling, transport, and analysis. Field duplicates and collocated samples provide estimates of micro-scale variability of contaminants such as radionuclides in sediments and dioxins in soil.

Note 2A: ~~Section 6.1~~ Quality Control Samples Supplement

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1.0 INTRODUCTION TO QA/QC SAMPLES

Note 2A has been added to Annex II, Note 2 of the ~~1995~~ RFI OU 1114 Work Plan for as a supplement. It uses available QA/QC sample data from the 1994 (LANL 1993, 1990) summer sampling season, extracted from the Facility for Information Management and Display (FIMAD) between February 13, ~~1995~~ and February 17, 1995, to determine which QA/QC samples give the most value added information. Those data were analyzed to determine: what QA/QC samples would yield the most useful information for OU 1114

and how many of each QA/QC sample should be proposed for the OU 1114 RFI Addendum 1.

It should be noted that the recommendations put forth in supplement were followed in writing the Chapter 5, Addendum 1 sampling plans. In one case Field Unit One technical team personnel recommend that no further spiked samples be submitted as described in Subsection 2.3.2; however, the recommendation does not preclude any contractual agreements between the contract laboratories and CST-3 for supplying spiked samples if required.

2.3.2 SAMPLE BLANKS

Blank samples are used to detect and estimate positive analyte biases incurred through collection, handling, and analyses of samples. To determine the number of blank samples that should be taken to maintain adequate quality control and assessment over field activities, OU 1114 data for the 1994 summer sampling season were reviewed. Of 2 933 analyte determinations performed on 25 blanks at OU 1114, the five analytes listed in Table II-2 were detected.

TABLE II-2

NUMBER OF ANALYTES DETECTED IN SAMPLE BLANKS

ANALYTE	NUMBER OF DETECTS	DETECTION RANGE	EQL[a] OR EDL[b]	SAL[c]
Chloroform	7	6 to 9 µg/L	5 µg/L (EQL)	210 µg/kg
Copper	2	30 to 34 µg/L	25 µg/L (EDL)	3,000 mg/kg
Iron	2	125 to 227 µg/L	100 µg/L (EDL)	NA
Lead	2	4.4 to 5.8 µg/L	3 µg/L (EDL)	500 mg/kg
Zinc	2	26 to 68.3 µg/L	20 µg/L (EDL)	24,000 mg/kg

[a]EQL = Estimated quantitation limit.

[b]EDL = Estimated detection limit.

[d]NA = Not available

[c]SAL = Screening action level

Eight instances of detection occurred for the four metals in only five samples. Chloroform was detected in seven other blank samples but in none of the field samples. All totaled, 15 analyte detections were registered out

of 2 933 determinations, or a 0.5% analyte detection rate. All analytes detected in the blanks were detected at concentrations within a factor of approximately three times their respective estimated quantitation limits (EQLs) or estimated detection limits (EDLs). An EQL is the limit representing the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operations. The EQL is generally 5 to 10 times the method detection limit but, to simplify data reporting, it may be a nominal value chosen within these guidelines. The EQL may be the concentration that is the lowest non-zero concentration standard used to generate the analytical calibration curve. EQLs may not always be achievable.

An EDL is the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix type containing the analyte. The contaminant detection rate in the blanks is low and the respective contaminant concentrations are very low relative to screening action levels (SALs). Given this, the following approach for computing the number of field QC blanks to be collected in the future is recommended.

Assume that a 10% analyte detection rate can be tolerated because historically, when an analyte is detected, its concentration is such that it is much less than its SAL. Also assume that the detection of one analyte is not correlated with detection of another analyte and that the distribution of detection rates in the contaminated blanks is Gaussian. With a 95% confidence level of detecting contamination, this equates to a mean value of a 5% detection rate with a standard error of the mean equal to 2.5%. Thus, 0.05 represents P, the mean proportion of analytes detected and 0.025 represents the standard error of the mean. The equation relating the distribution of analyte detection rate to the number of samples required to detect P with a given level of confidence is:

$$SE(P) = \sqrt{\frac{P(1-P)}{n}}$$

where P is defined above, $SE(P)$ is the standard error of P, and n = the number of samples required to yield the desired confidence in detecting contamination at the accepted rate (Barnett 1974, 17-1218). This equation rearranges to:

$$n = \frac{P(1-P)}{[SE(P)]^2}$$

Au: source of this equation?

and allows for easily computing n.

With $P = 0.05$ and $SE(P) = 0.025$ a value of $n = 76$ is computed. ~~Since~~ Because each volatile organic analysis includes the determination of 60 analytes, $n = 76$ translates to two trip blank samples ($n = 76/60$ => 2 samples) for detecting volatile organic contamination. Using similar logic, and an assumption of 23 analytes included in a typical metals analysis suite, a total of four equipment rinsate blanks is computed ($n = 76/23$ => 4 samples) for detecting metals contamination.

The OU 1114 technical team recommended that field reagent blanks be eliminated from the QA/QC sample scheme. Although two field reagent blanks showed chloroform contamination, the chloroform detected could be due to laboratory contamination (no chloroform was detected in actual field samples) and the detected contamination is within a factor of 1.5 of the EQL. In addition, no volatile organics were detected in the duplicate and collocated samples. This, in conjunction with the fact that equipment rinsate blanks should include any contaminants likely to show up in field reagent blanks, is the rationale for eliminating field reagent blanks from the QA sample scheme.

Au: Are you still using field reagent blanks?

No radioactive contaminants were detected in the blank sampler at activities statistically greater than zero. Because radionuclides were detected in the environmental samples but not the blanks, implementation of field sampling and decontamination protocols is assumed to be adequate. This is corroborated by the fact that metals and organic contaminants are present at concentrations approximately two to three orders of magnitude less than concentrations of interest for screening, i.e., SALs. Such low contaminant

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concentrations are dwarfed by the imprecision associated with sampling and analyses.

Because radionuclide contaminants have not been a problem in the blanks, there is probably no need to monitor for radionuclide contamination. Because there is a greater expectation that organic contaminants will be present in PRSs, VOCs and SVOCs, this field season than last field season, should be monitored. Since metals have been the most frequently observed COCs, they too should be monitored. Audits of field personnel compliance with sample collection and equipment decontamination procedures, together with the following QC sample schedule in Table II-3, are also recommended.

TABLE II-3

RECOMMENDED NUMBER OF SAMPLE BLANKS

QC SAMPLE	NUMBER COLLECTED (RFI ADDENDUM 1)	ANALYSES PERFORMED
Equipment rinsate blank	4	Metals, VOAs
Trip blank	2	Metals, VOAs

If metal contamination is detected in blanks, one should suspect that radionuclides, if present in the environmental samples, are also possible contaminants. Judicious use of the chemistry van for monitoring metals contaminants using, for example, laser-induced breakdown spectroscopy (LIBS) might provide near-realtime screening for metals contaminants. A possible alternative is to have CST-5 dedicate a particular instrument in their laboratory (either wholly or partially) to rapid turnaround of such samples for metals analyses. This would require coordination with CST-5 in advance of sending the quick turnaround samples to them. Hand-held screening or use of the radiochemistry van for realtime or near-realtime screening of samples for radioactivity might also be an option. The chemistry van should be considered for use in near-realtime analysis of blanks and environmental samples for organic contaminants.

3.0 ~~2.2~~ ESTIMATION OF SAMPLING ERROR AND POPULATION VARIABILITY

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Collocated samples provide information on the repeatability of sampling (sampling error) and on very small-scale COC concentration distributions (population variability); duplicate samples provide information on larger scale distribution of COC concentrations. The component of sampling error obtained through the use of field splits is contained within collocated and duplicate field samples. Therefore, it is recommended that field splits not be taken, but that a series of collocated samples be taken to estimate small scale population variance and field duplicates be taken to gain an estimate of population variance on a wider scale.

Total variability for all sample data for inorganic analyses was 82% risk-specific dose (RSD) (OU 1114 data extracted from FIMAD between February 13, ~~1995~~ and February 17, 1995). This is marginally greater than 73% RSD, which is the maximum observed for collocated and field split samples from the same data set. However, from available data, only five pairs of field splits ~~were analyzed for metals~~ and three pairs of collocated samples were analyzed for metals. Two pairs of collocated samples were analyzed for radionuclides. These low numbers of samples provide little statistical power in the estimate of variances. More statistical power can be obtained by taking more samples. The means of determining an appropriate number of samples to be collected is described below.

Assuming a desired 95% confidence level in the estimate of small-scale and large-scale variances, the number of sample pairs required to yield a range of values containing the true variance can be obtained from Table 3 of *A Rationale for the Assessment of Errors in the Sampling of Soils* (van Ee and Starks 1990, 17-1219). That table shows that, with 10 sample pairs (10 degrees of freedom), the estimated variance has a 95% probability of lying within the range of 0.49 to 3.08 of the true variance. Because the variance is the square of the standard deviation, this can be converted to an estimate of the precision of the standard deviation by taking square roots. Doing so reveals that the estimated standard deviation would have 95% probability of falling within the range of 0.70 to 1.75 times the true standard deviation. Using similar calculations, 20 samples would provide an estimate of sampling standard deviation ranging from 0.76 to 1.44 of the true standard deviation. Thus, a doubling of the sample size (i.e., a doubling of sampling/analysis cost) provides only about a 30% decrease in the range of values associated with the estimate of sampling error standard deviation. For this reason, it is recommended that the numbers of the indicated samples (Table ~~II-4~~ 3) be collected and analyzed to gain estimates of sampling and population variability.

TABLE 3

RECOMMENDED NUMBER OF COLLOCATED AND FIELD DUPLICATE SAMPLES

Again is the total number

QC SAMPLE	NUMBER COLLECTED (RFI ADDENDUM 1)	ANALYSES PERFORMED
Field collocated sample	10	Metals, VOAs, SVOAs
Field duplicate	10	Metals, VOAs, SVOAs

If radionuclides are of concern at a particular PRS, they may be added to the analyte list so that an estimated variability for radionuclide concentrations can be obtained.

4.0 SPIKED SAMPLES

Spiked samples may be used to obtain estimates of variability and bias for those analytes that have been spiked into a sample, as well as those that appear naturally in the sample. The variability and bias represent the errors associated with sample handling, storage, and analysis as well as matrix-specific effects. Thus, ideally, the sample that is spiked has a matrix identical to that of the environmental samples of interest. This cannot be commonly achieved and a sample matrix that approximates the environmental sample matrix is actually spiked.

Data available to date indicate that a single, spiked water sample was analyzed at OU 1114 during the 1994 summer sampling season. However, field spikes of water do not represent soil sample collection and analyses because of the great differences between soil and water matrices. Therefore, it is recommended that field spikes be eliminated from the QA sample scheme. In addition, the surrogate standard addition to, and matrix spiking of, soil samples ~~which~~ that are part of existing laboratory protocols provide better indicators of analyte recovery in soils than spiked water samples.

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Include refs for Barnett, Van Ee + LANL 1993, 1990

Note 3: Section 14.3 Sample Representativeness

The field sampling plans presented in the OU 1114 Work Plan, Chapter 5, were developed to meet the sample representativeness criteria described in Subsection 14.3 of the Laboratory ER Program generic QAPjP (Appendix T) (LANL 1991, 0553).

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Barnett, V., 1974. *Elements of Sampling Theory*, Edward Arnold publishers, London. **(Barnett 1974, 17-1218)**

van Ee, J. J., and T. H. Starks, May 1990. *A Rationale for the Assessment of Errors in the Sampling of Soils*, US Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Office of Research and Development, EPA/600/4-90/013. ? **(van Ee and Starks 1990, 17-1219)**

LANL (Los Alamos National Laboratory), November 1991. "Installation Work Plan for Environmental Restoration," Revision 1, Los Alamos National Laboratory Report LA-UR-91-3310, Los Alamos, New Mexico. **(LANL 1991, 0553)**

LANL (Los Alamos National Laboratory), November 1992. "Installation Work Plan for Environmental Restoration," Revision 2, Los Alamos National Laboratory Report LA-UR-92-3795, Los Alamos, New Mexico. **(LANL 1992, 0768)**

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- A collocated sample is a second sample collected next to the first sample, as close as practicable (usually 1 to 2 ft away), using the same method as the first (another spade or scoop sample, another manual shallow core, etc.). In general, subsamples for the collocated sample are prepared for each proposed analysis as for the first sample.

- A field split is a second subsample collected in the field from a prepared (e.g., homogenized) sample for a designated type of analysis. This can be appropriate for inorganic, radionuclide, and most semivolatile organic analyses, but in general is not useful for volatile organic analyses.

- A field duplicate is a second subsample collected for a minimally disturbed field sample (usually a core) for a designated type of analysis. Field duplicates are used in place of field splits for volatile compounds.

Collocated samples provide an estimate of "total study error" (apart from overall population variability, which is captured by taking a number of samples from the site). Field splits and field duplicates are used to estimate incremental error introduced by imperfect homogenization, handling, transport, and analysis. Field duplicates and collocated samples provide estimates of micro-scale variability of contaminants such as radionuclides in sediments and dioxins in soil.

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2.3 *Note 2A:* Section 6.1 Quality Control Samples Supplement

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2.3.1 INTRODUCTION TO QA/QC SAMPLES

Note 2A has been added to Annex II, Note 2 of the 1993 OU 1114 Work Plan (LANL 1993, 10490) as a supplement. It uses available QA/QC sample data from the 1994 summer sampling season, extracted from FIMAD (the Facility for Information Management and Display) between February 13, 1995 and February 17, 1995, to determine which QA/QC samples give the most value added information. Those data were analyzed to determine: what QA/QC samples would yield the most useful information for OU 1114

and how many of each QA/QC sample should be proposed for the OU 1114 RFI ~~Addendum 1.~~

It should be noted that the recommendations ~~put forth~~ in supplement were followed in writing the ~~Chapter 5, Addendum 1, sampling plans.~~ In one case Field Unit One technical team personnel recommend that no ~~further~~ spike samples be submitted as described in Subsection 2.3.~~4.~~ however, the recommendation does not preclude any contractual agreements between the contract laboratories and CST-3 for supplying spiked samples if required.

2.3.2 SAMPLE BLANKS

Blank samples are used to detect and estimate positive analyte biases incurred through collection, handling, and analyses ~~of samples.~~ To determine the number of blank samples that should be taken to maintain adequate quality control and assessment over field activities, OU ~~1114~~ data for the 1994 summer sampling season were reviewed. Of 2 933 analyte determinations performed on 25 blanks at OU 1114, the ~~five~~ analytes listed in Table ~~II-2~~ were detected.

TABLE ~~II-2~~

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ANALYTE	NUMBER OF DETECTS	DETECTION RANGE	EQL[a] OR EDL[b]	SAL[c]
Chloroform	7	6 to 9 µg/L	5 µg/L (EQL)	210 µg/kg
Copper	2	30 to 34 µg/L	25 µg/L (EDL)	3,000 mg/kg
Iron	2	125 to 227 µg/L	100 µg/L (EDL)	NA
Lead	2	4.4 to 5.8 µg/L	3 µg/L (EDL)	500 mg/kg
Zinc	2	26 to 68.3 µg/L	20 µg/L (EDL)	24,000 mg/kg

[a]EQL = Estimated quantitation limit.

[b]EDL = Estimated detection limit.

Eight instances of detection occurred for the four metals in only five samples. Chloroform was detected in seven other blank samples but in none of the field samples. All totaled, 15 analyte detections were registered out

of 2 933 determinations, or a 0.5% analyte detection rate. All analytes detected in the blanks were detected at concentrations within a factor of approximately three times their respective estimated quantitation limits (EQLs) or estimated detection limits (EDLs). An EQL is the limit representing the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operations. The EQL is generally 5 to 10 times the method detection limit but, to simplify data reporting, it may be a nominal value chosen within these guidelines. The EQL may be the concentration that is the lowest non-zero concentration standard used to generate the analytical calibration curve. EQLs may not always be achievable.

An EDL is the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix type containing the analyte. The contaminant detection rate in the blanks is low and the respective contaminant concentrations are very low relative to screening action levels (SALs). Given this, the following approach for computing the number of field QC blanks to be collected in the future is recommended.

Assume that a 10% analyte detection rate can be tolerated because historically, when an analyte is detected, its concentration is such that it is much less than its SAL. Also assume that the detection of one analyte is not correlated with detection of another analyte and that the distribution of detection rates in the contaminated blanks is Gaussian. With a 95% confidence level of detecting contamination, this equates to a mean value of a 5% detection rate with a standard error of the mean equal to 2.5%. Thus, 0.05 represents *P*, the mean proportion of analytes detected and 0.025 represents the standard error of the mean. The equation relating the distribution of analyte detection rate to the number of samples required to detect *P* with a given level of confidence is:

$$SE(P) = \sqrt{\frac{P(1-P)}{n}}$$

where P is defined above, $SE(P)$ is the standard error of P, and n = the number of samples required to yield the desired confidence in detecting contamination at the accepted rate (Barnett 1974, 17-1218). This equation rearranges to:

$$n = \frac{P(1-P)}{[SE(P)]^2}$$

Q: Source of this equation?

and allows for easily computing n.

With $P = 0.05$ and $SE(P) = 0.025$ a value of $n = 76$ is computed. Since each volatile organic analysis includes the determination of 60 analytes, $n = 76$ translates to two trip blank samples ($n = 76/60 \Rightarrow 2$ samples) for detecting volatile organic contamination. Using similar logic, and an assumption of 23 analytes included in a typical metals analysis suite, a total of four equipment rinsate blanks is computed ($n = 76/23 \Rightarrow 4$ samples) for detecting metals contamination.

The OU 1114 technical team recommended that field reagent blanks be eliminated from the QA/QC sample scheme. Although two field reagent blanks showed chloroform contamination, the chloroform detected could be due to laboratory contamination (no chloroform was detected in actual field samples) and the detected contamination is within a factor of 1.5 of the EQL. In addition, no volatile organics were detected in the duplicate and collocated samples. This, in conjunction with the fact that equipment rinsate blanks should include any contaminants likely to show up in field reagent blanks, is the rationale for eliminating field reagent blanks from the QA sample scheme.

Q: Why are you still discussing field reagent blanks?

No radioactive contaminants were detected in the blanks at activities statistically greater than zero. Because radionuclides were detected in the environmental samples but not the blanks, implementation of field sampling and decontamination protocols is assumed to be adequate. This is corroborated by the fact that metals and organic contaminants are present at concentrations approximately two to three orders of magnitude less than concentrations of interest for screening, i.e., SALs. Such low contaminant

concentrations are dwarfed by the imprecision associated with sampling and analyses.

Because radionuclide contaminants have not been a problem in the blanks, there is probably no need to monitor for radionuclide contamination. Because there is a greater expectation that organic contaminants will be present in PRSs, VOCs and SVOCs, this field season than last field season, should be monitored. Since metals have been the most frequently observed COCs, they too should be monitored. Audits of field personnel compliance with sample collection and equipment decontamination procedures, together with the following QC sample schedule in Table II-3, are also recommended.

TABLE II-3

RECOMMENDED NUMBER OF SAMPLE BLANKS

QC SAMPLE	NUMBER COLLECTED (RFI ADDENDUM 1)	ANALYSES PERFORMED
Equipment rinsate blank	4	Metals, VOAs
Trip blank	2	Metals, VOAs

If metal contamination is detected in blanks, one should suspect that radionuclides, if present in the environmental samples, are also possible contaminants. Judicious use of the chemistry van for monitoring metals contaminants using, for example, laser-induced breakdown spectroscopy (LIBS) might provide near-realtime screening for metals contaminants. A possible alternative is to have CST-9 dedicate a particular instrument in their laboratory (either wholly or partially) to rapid turnaround of such samples for metals analyses. This would require coordination with CST-9 in advance of sending the quick turnaround samples to them. Hand-held screening or use of the radiochemistry van for realtime or near-realtime screening of samples for radioactivity might also be an option. The chemistry van should be considered for use in near-realtime analysis of blanks and environmental samples for organic contaminants.

3.0 ~~2.3.2~~ ESTIMATION OF SAMPLING ERROR AND POPULATION VARIABILITY

Collocated samples provide information on the repeatability of sampling (sampling error) and on very small-scale COC concentration distributions (population variability); duplicate samples provide information on larger scale distribution of COC concentrations. The component of sampling error obtained through the use of field splits is contained within collocated and duplicate field samples. Therefore, it is recommended that field splits not be taken, but that a series of collocated samples be taken to estimate small scale population variance and field duplicates be taken to gain an estimate of population variance on a wider scale.

Total variability for all sample data for inorganic analyses was 82% risk-specific dose (RSD) (OU 1114 data extracted from FIMAD between February 13, 1995 and February 17, 1995). This is marginally greater than 73% RSD, which is the maximum observed for collocated and field split samples from the same data set. However, from available data, only five pairs of field splits ~~were analyzed for metals~~ and three pairs of collocated samples were analyzed for metals. Two pairs of collocated samples were analyzed for radionuclides. These low numbers of samples provide little statistical power in the estimate of variances. More statistical power can be obtained by taking more samples. The means of determining an appropriate number of samples to be collected is described below.

Assuming a desired 95% confidence level in the estimate of small-scale and large-scale variances, the number of sample pairs required to yield a range of values containing the true variance can be obtained from Table 3 of *A Rationale for the Assessment of Errors in the Sampling of Soils* (van Ee and Starks 1990, 17-1219). That table shows that, with 10 sample pairs (10 degrees of freedom), the estimated variance has a 95% probability of lying within the range of 0.49 to 3.08 of the true variance. Because the variance is the square of the standard deviation, this can be converted to an estimate of the precision of the standard deviation by taking square roots. Doing so reveals that the estimated standard deviation would have 95% probability of falling within the range of 0.70 to 1.75 times the true standard deviation. Using similar calculations, 20 samples would provide an estimate of sampling standard deviation ranging from 0.76 to 1.44 of the true standard deviation. Thus, a doubling of the sample size (i.e., a doubling of sampling/analysis cost) provides only about a 30% decrease in the range of values associated with the estimate of sampling error standard deviation. For this reason, it is recommended that the numbers of the indicated samples (Table ~~II-4~~ 3) be collected and analyzed to gain estimates of sampling and population variability.

TABLE II-4

RECOMMENDED NUMBER OF COLLOCATED AND FIELD DUPLICATE SAMPLES

QC SAMPLE	NUMBER COLLECTED (RFI ADDENDUM 1)	ANALYSES PERFORMED
Field collocated sample	10	Metals, VOAs, SVOAs
Field duplicate	10	Metals, VOAs, SVOAs

If radionuclides are of concern at a particular PRS, they may be added to the analyte list so that an estimated variability for radionuclide concentrations can be obtained.

2.3.4 SPIKED SAMPLES

Spiked samples may be used to obtain estimates of variability and bias for those analytes that have been spiked into a sample, as well as those that appear naturally in the sample. The variability and bias represent the errors associated with sample handling, storage, and analysis as well as matrix-specific effects. Thus, ideally, the sample that is spiked has a matrix identical to that of the environmental samples of interest. This cannot be commonly achieved and a sample matrix that approximates the environmental sample matrix is actually spiked.

Data available to date indicate that a single, spiked water sample was analyzed at OU 1114 during the 1994 summer sampling season. However, field spikes of water do not represent soil sample collection and analyses because of the great differences between soil and water matrices. Therefore, it is recommended that field spikes be eliminated from the QA sample scheme. In addition, the surrogate standard addition to, and matrix spiking of, soil samples which are part of existing laboratory protocols provide better indicators of analyte recovery in soils than spiked water samples.

2.4 Note 3: Section 14.3 Sample Representativeness

The field sampling plans presented in the OU 1114 Work Plan, Chapter 5, were developed to meet the sample representativeness criteria described in Subsection 14.3 of the Laboratory ER Program generic QAPjP (Appendix T) (LANL 1991, 0553).

2.5 Note 4: Section 16.1 Field Quality Assurance Reports to Management

The OU field teams leader or a designee will provide a monthly field progress report to the ER PL. This report will consist of the information identified in Subsection 16.1 of the ER Program generic QAPjP (Appendix T) (LANL 1991, 0553).

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EDITING WORKSHEET

[illegible], Oc[illegible], Addendum
March 1995 draft

Acronym or Hyphenation List

A	B	C COCs ?
D	E ER ! EQA ? EDA ?	F
G	H	I IAP !
J	K	L LTBU ?
M	N	O ~~GAP, P~~ ! OU !
P PL !	Q QAPP ! QPP ! QA 3 QC 3	R RCRA ! RFI RCD 10
S SOP ! SCF ? SAP ?	T	U
V	W	XYZ

OU 1114 Annex II

EDITING WORKSHEET

Acronym or Hyphenation List

A	B	C CCCs 3
D	E EDLs 1 EGLs 1	F FIMAD 1
G	H	I
J	K	L LANL's 1 LIBS 3
M	N	O OU
P PRSs 3	Q QA/QC 1	R RSD 4
S SALs (2)	T	U
V VOCs 3	W	XYZ

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