U.S. Department of Energy

Oakland Operations Office, Oakland, California

FINAL
WORK PLAN for DATA GAPS INVESTIGATION

at the

Laboratory for Energy-Related Health Research (LEHR)
University of California at Davis, California

Submitted to:

Weiss Associates
5500 Shellmound Street
Emeryville, California 94608

Prepared by:

IT Corporation
4585 Pacheco Boulevard
Martinez, California 94553

June 1997
Rev. 0

T3.9.2.4

DOE Oakland Operations Office Contract DE-AC03-96SF20686

Weiss Associates
Environmental and Geologic Services

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Issued To: Elizabeth Carrier Date: 6/4/97

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Approvals Page

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SOP 3.0 Logging of Soil – Visual USCS

SOP 4.0 Surface/Subsurface Sampling

SOP 5.0 Borehole Sampling

SOP 6.0 Chain-of-Custody

ACRONYMS

AH	Animal Hospital
ANSI	American National Standards Institute
AOC	Area of Containment
Bgs	Below ground surface
CA	Contaminated Area
COC	Chain-of-Custody
DAC	Derived Air Concentration
USDOE	United States Department of Energy
DQO	Data Quality Objective
EE/CA	Engineering Evaluation/Cost Analysis
USEPA	United States Environmental Protection Agency
FC	Field Coordinator
Gal	Gallons
GM	Geiger Müeller Detector
SHSO	Site Health and Safety Officer
HWP	Hazardous Work Permit
ID	Identification
IDW	Investigation-Derived Waste
ITEH	Institute of Toxicological and Environmental Health
LAS	LAS Laboratories
LEHR	Laboratory for Energy-Related Health Research
LFI	Limited Field Investigation
OSHA	Occupational Safety and Health Administration
OU	Operable Unit

PID	Photoionization Detector
PHSP	Project Health and Safety Plan
pCi/g	PicoCurie(s) per gram
PPE	Personal Protective Equipment
PVC	Poly Vinyl Chloride
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RI/FS	Remedial Investigation/Feasibility Study
SCIN	Scintillation detector
RPM	Remedial Project Manager
SOP	Standard Operating Procedure
SQP	Standard Quality Procedure
TSM	Tailgate Safety Meeting
USA	Underground Services Alert
USCS	Unified Soil Classification System
UC Davis	University of California at Davis
VOC	Volatile Organic Compound
WA	Weiss Associates

1. INTRODUCTION

This work plan outlines procedures to investigate five domestic septic systems and the northern extent of the radium-226 seepage trench at the Laboratory for Energy-Related Health Research (LEHR) at the University of California at Davis (UC Davis). The general approach for the data gaps investigation was discussed with the LEHR Remedial Project Managers (RPMs) on March 13, 1997. As discussed at that meeting, this plan generally conforms to the sampling methods, analytes and practices approved by the RPMs for use in the Limited Field Investigation (LFI) conducted at LEHR in 1996.

The primary objective of the data gaps investigation is to collect the necessary information to determine if any of the five domestic septic systems and/or the northern extent of the radium-226 seepage trench pose unacceptable risk to human health or the environment. The proposed soil sample locations target locations of likely maximum contaminant concentration based on the current conceptual model of each work area, and on field screening measurements and analyses associated with the LFI.

A description of the domestic septic tanks and the radium treatment system is provided below and detailed in the LFI Work Plan (IT, 1996), Site Characterization Report (WA, 1997) and the Remedial Investigation/Feasibility Study (RI/FS) Work Plan (Dames and Moore, 1994).

1.1 Domestic Septic Tank Systems (OU-4)

There are seven known domestic septic tanks located throughout the LEHR site and collectively they constitute Operable Unit 4 (OU-4) (Figure 1). Five of the seven septic tanks have been identified for data gap investigation and are numbered 1, 3, 4, 5, and 6 for identification purposes. Two of the tanks, numbered 2 and 7, are not included in this investigation because they have been previously assessed (Dames and Moore, 1993, WA, 1996).

The domestic septic tanks served LEHR offices and laboratories prior to the site's connection to the UC Davis Wastewater Treatment Plant in 1970. After the facility was connected to the UC Davis Wastewater Treatment Plant, the domestic septic tanks were reportedly abandoned in-place and filled with sand (Dames and Moore, 1993).

No formal closure records confirming the abandonment of the domestic septic tanks have been identified (Dames and Moore, 1994). Although domestic sewage is not usually considered hazardous, the LEHR septic tank systems may have received influent from laboratory sinks and floor drains. Therefore, the potential exists that hazardous and/or radioactive materials were disposed through these septic tank systems during operation of the LEHR facility.

Septic Tank 1 (Figure 1) was positively located as part of preliminary work conducted during the Phase II Site Characterization (Dames and Moore, 1993). Soil samples were collected below Septic Tank 1 during the LFI (WA, 1997a). As part of the 1996 LFI, Septic Tank 1 was opened to sample its contents. Upon opening Tank 1, it was noted that sandy gravel filled the tank. Because sandy gravel is not characteristic of typical septic tank contents, it appeared that the original tank contents had been removed, and the tank backfilled with clean, sandy gravel. Therefore, no sediment samples were collected from Septic Tank 1 during the LFI. It was determined during the 1996 LFI that a subsurface cast iron pipe discharged effluent from the tank; however, the distal end of the pipe and the leach field associated with Tank 1 were not located. Consequently, soil samples adjacent to the leach field were not collected for chemical or radiological analysis.

In late 1996, the effluent line from Septic Tank 1 was traced 80 feet south of the tank using a transmitter mounted on a fiberglass rod. Data from this activity suggest that the effluent line was truncated about 4.25 feet below ground surface (bgs) and left uncapped during the installation of a sanitary sewer line.

The locations of Tanks 3, 4, 5, and 6 are only approximately known (Figure 1). The presence of underground utilities limited planned LFI exploration, and thus septic tank sediment, leach line material, and adjacent soils were not sampled. In addition, no tank sediments, leach field material, or adjacent soils were sampled during the Phase II Site Characterization. Consequently, there are no analytical data to characterize the contents or evaluate the potential impacts to the environment from these systems (WA, 1997a).

1.2 Radium Treatment System

The Radium Treatment System is located between Animal Hospitals 1 and 2 (AH-1 and AH-2) along the west boundary of the LEHR site (Figure 1). The Radium-226 Treatment System reportedly received radioactive waste including fecal material and washdown water from facilities in AH-2 (Dames and Moore, 1994). The Radium Treatment System consists of four radium treatment tanks, one distribution box, three dry wells, and one seepage trench (Figure 2). The Radium-226 treatment tanks are located underground between the former Imhoff Building and AH-2 and have a combined capacity of 14,400 gallons (gal) (WA, 1997a). The distribution box is three feet in diameter and six feet deep. The dry wells are approximately 30 inches in diameter and 40 feet deep. The seepage trench is reportedly about 91 feet long, 3 feet wide, and 14 feet deep (Dames and Moore, 1994).

Soil samples were collected from the seepage trench and near the dry wells from exploratory trenches and boreholes during the LFI. Laboratory testing of these samples indicated the following activities for the radionuclides of primary interest for this portion of Operable Unit 2 (OU-2) (WA, 1997a):

- Ra-226: up to 15.0 picoCuries per gram (pCi/g); and
- Sr-90: up to 6.1 pCi/g.

Available UC Davis records regarding the northern extent of the seepage trench conflict with one another. Consequently, data gap investigations in this OU will focus on determining whether the seepage trench extends north of the northernmost dry well (Figure 2). If found, an attempt will be made to determine the length of the trench without excavating it. In the event that it is necessary to excavate the entire trench length, present schedule and cost guidelines will be reviewed to determine if this is possible within the planned work scope.

2. FIELD ACTIVITIES

This section describes the proposed field activities for the data gaps investigation of the two subject OUs. Fieldwork will be conducted according to the Standard Operating Procedures (SOPs) presented in Appendix A of this work plan.

2.1 Septic Tanks

Data gaps investigation field activities for the septic tanks will consist of:

- Underground utility clearance;
- Exploration trenching and sampling at Tank 1;
- Exploration hand augering and sampling at Tanks 3, 4, 5, and 6; and,
- Drilling and sampling at Tanks 3, 4, 5, and 6.

Each of these is further described below.

2.1.1 Underground Utility Clearance

Underground utility clearance will be performed prior to exploration trenching, hand augering, and drilling activities. A white box will be spray painted on the ground surface at each sampling location(s) to designate the specific area(s) requiring utility clearance. Underground Services Alert (USA) will be contacted at least 48 hours prior to the start of fieldwork and UC Davis Facilities Services will also be alerted to the proposed fieldwork. The UC Davis Facilities Service Department will visit the proposed sampling locations and clear each location of UC Davis utilities.

If for any reason the UC Davis Facilities Services Department is uncertain as to the exact location of a utility, an independent line locator may be subcontracted to verify the UC Davis Facilities Service Department's utility clearance prior to the start of any fieldwork. Once USA and UC Davis have cleared the proposed sampling locations, fieldwork can begin. During the fieldwork, the first 5 ft of ground at each proposed soil boring location will be hand-augered as an additional safeguard against unknowingly damaging unmarked utilities.

2.1.2 Exploration and Sampling

This section describes proposed exploration and sampling activities for each septic tank location OU-4.

2.1.2.1 Septic Tank 1

Two exploratory trenches, T1 and possibly T3, will be excavated to locate and sample the leach field associated with Septic Tank 1 (Figure 2). The approximate length of trench T1 will be 8 feet and the depth will be 5 feet bgs. The approximate length of trench T3 will be 8 feet and the depth will be 10 feet bgs. The depth of trench T1 is assumed sufficient to access the truncated effluent line associated with Tank 1. The location of trench T3 shown on Figure 2 is only approximate. Whether or not trench T3 is excavated and its actual placement, will be determined in the field and will depend on the results of the T1 excavation and the results of the fiberglass leach field tracing described below. Based on observations noted, during 1996 LFI activities, the depth specified for trench T3, if made, should be sufficient to collect the data specified in this section of the workplan.

It is anticipated that the leach field for Septic Tank 1 will be located at the termination of the effluent pipe for this tank. T1 will be located south of the sanitary sewer pipe that truncates the effluent pipe. To identify the location and orientation for T1, the field crew leader will ascertain the diameter, orientation and location of the sanitary sewer pipe by looking into the sewer pipe through the manholes at each end of this section of pipe (Figure 2). T1 will intercept the cast iron effluent pipe from Septic Tank 1 where it is truncated by a cement sanitary sewer pipe (Figure 2). A ½-inch diameter fiberglass rod will be inserted into the southern portion of the effluent pipe to determine its length and approximate termination point. In the event the pipe end is capped, it will be cut off to allow for insertion of the fiberglass rod. In the event the pipe is plugged with solid matter, a decision will be made as to how best to proceed. For example, assessment of site-specific conditions may allow for excavation of the pipe as a possible means to locate the leach line.

Exploratory trenching will be performed in accordance with SOP 1.0, Exploratory Trench Excavation (Appendix A). Photographs and written logs of each trench will be made to document the materials encountered in accordance with SOP 1.0, Exploratory Trench Excavation, and SOP 3.0, Logging of Soil - Visual Unified Soil Classification System (USCS) (Appendix A). The materials from the trenches will be screened in the field for Volatile Organic Compounds (VOC) using a Photoionization Detector (PID) and for radiologic activity using a Geiger Müeller (GM) counter and Scintillation detector (SCIN) to guide the selection of waste and soil samples for laboratory testing and assure field worker safety. Soil samples will be collected at discrete depth intervals to assess the vertical distribution of laboratory test parameters in trench T3. Collection of soil samples from trench T3 will involve placing soil from the backhoe bucket into pre-sterilized glass sample jars using pre-sterilized disposable scoops. Sample handling, packaging, and shipping are described in SOP 2.0 (Appendix A). One sample set will be collected from trench T3 and will consist of:

- One native soil sample from immediately below the leach field;
- One native soil sample 2.5 to 5 feet below the first sample;
- One native soil sample 7.5 to 10 feet below the first sample;
- One Quality Assurance/Quality Control (QA/QC) split sample; and
- One equipment blank.

Table 2-1 summarizes the number and type of samples that will be collected. Table 4-1 summarizes the chemical and radiological parameters for which these samples will be tested by the contract laboratory.

Following the excavation and sampling activities, the trenches will be backfilled with the same material that was removed during trenching. Every effort will be made to return the leach line material to the same position from which it was removed. In locations where trenches were made through asphalted roadways or cemented sidewalks, trenches will be backfilled to grade and cultural features (e.g. asphalt) replaced. Any removed soil, asphalt or concrete will be surveyed with the appropriate radiological instruments and disposed or recycled in an appropriate manner.

2.1.2.2 Septic Tank 3

A minimum of 9 hand auger borings will be radially drilled to the location of Septic Tank 3 and its associated leach lines (Figure 3). This radial distribution of borings may be modified in the field based on the locations of existing underground utilities and other obstructions. Hand augers will be advanced to 5 feet below grade in an attempt to locate the septic tank and its associated leach lines. In the event that the septic tank is located, an assessment will be made as to whether there is sufficient clearance from utilities and other obstructions to open the tank. If the tank can be opened, then sediment samples from the interior will be collected for laboratory analysis unless the material is not representative of the septic system (e.g., sandy gravel fill). In the event that multiple leach lines are located, one sample set will be collected adjacent to each located line, as described below.

Shallow soil samples will be collected using a split barrel sampler. Shallow soil sampling will be conducted in accordance with SOP 4.0, Surface/ Subsurface Sampling and SOP 2.0, Sample Handling, Packaging, and Shipping (Appendix A). Soil logging will be performed using the USCS method discussed in SOP 3.0, Logging of Soil - Visual USCS (Appendix A). One shallow soil sample set will be collected at each located leach line and will consist of:

- One native soil sample from immediately below the leach field;
- One native soil sample 2.5 to 5.0 feet below the first sample;
- One tank sediment sample (if possible);
- One QA/QC split sample; and
- One equipment blank.

Deeper soil samples will be collected using resonant sonic coring. Sonic coring has been successfully used at LEHR (WA, 1996). This coring method produces minimal waste, provides high quality core for logging purposes, is rapid, and specific sonic coring rigs can be used in areas of limited access like those associated with Septic Tanks 3 and 4. During logging of the core, a PID, GM, and SCIN will be used to screen for organic vapors and radionuclide activity. Core logging will be performed using the USCS method (Appendix A). Soil sample collection during drilling will be according to Section 4.3.2, Continuous Core Sampling System Methods in SOP 5.0 (Appendix A). Sample handling, packaging, and shipping are described in SOP 2.0 (Appendix A).

One deep soil sample set will be collected at each leach line location where shallow soil samples were collected and will consist of:

- One native soil sample 7.5 to 10 feet below the first shallow soil sample - depth not to exceed 15 feet bgs;
- One QA/QC split sample; and
- One equipment blank.

Table 2-1 summarizes the number and type of samples that will be collected. Table 4-1 summarizes the chemical and radiological parameters for which these samples will be tested by the contract laboratory.

At the conclusion of shallow soil sampling, the hand augered borings will be backfilled with soil and tamped to form a small mound. At the conclusion of deep soil sampling, coreholes will be backfilled to grade with grout. Grout will be mixed above ground and placed into the corehole with a tremie pipe. Unused core will be placed in a shallow trench located immediately near its point of origin and covered with native soil (Figure 1).

2.1.2.3 Septic Tank 4

A minimum of 5 hand auger borings will be radially drilled in an attempt to locate Septic Tank 4 and its associated leach lines (Figure 3). This radial distribution of borings may be modified in the field based on the locations of exiting underground utilities and other obstructions. In the event Septic Tank 4 is located, an assessment will be made as to whether there is sufficient clearance from utilities and other obstructions to open Septic Tank 4. If the tank can be opened, then sediment samples from the interior of Septic Tank 4 will be collected for analysis unless the material in the tank is not representative of the septic system (e.g., sandy gravel fill). All other procedures specified in Section 2.1.2.2 for exploration and sampling will be applied to Septic Tank 4 except that no QA/QC split samples and equipment blanks will be collected. One QA/QC split sample and one equipment blank will be collected for every 10 samples collected for laboratory testing. This protocol is fulfilled by collecting these types of samples in association with sampling at septic tank 1 and 3.

2.1.2.4 Septic Tank 5

A minimum of 6 hand auger borings will be made in an attempt to locate leach lines associated with Septic Tank 5 provided that no underground utilities and other obstructions are encountered (Figure 4). Septic Tank 5 is known to be underneath the main office and lab building so no attempt will be made to locate it (Dames and Moore, 1993). All other procedures specified in Section 2.1.2.2 for exploration and sampling will be applied to Septic Tank 5 except that no tank sediment samples, QA/QC split samples, and equipment blanks will be collected. One QA/QC split sample and one equipment blank will be collected for every 10 samples collected for laboratory testing. This protocol is fulfilled by collecting these types of samples in association with sampling at Septic Tank 1 and 3.

2.1.2.5 Septic Tank 6

A minimum of 7 hand auger borings will be radially drilled in an attempt to locate Septic Tank 6 and its associated leach lines (Figure 5). This radial distribution of borings may be modified in the field based on the locations of existing underground utilities and other obstructions. A subsurface 2-inch diameter plastic pipe that provides deionized water to LEHR laboratories is located directly above the suspected septic tank location. Although the existence of this line is not supported by UC Davis documentation, it was found during LFI exploratory trenching in 1996. Hand auger borings made to locate Septic Tank 6 will be to prevent damage to this pipe. In the event that Septic Tank 6 is located, the exact location of the deionized water line will be verified in the field, and an assessment will be made in collaboration with Institute of Toxicological and Environmental Health (ITEH) personnel as to whether temporary re-routing of the deionized line is practical to allow Septic Tank 6 to be opened. If the tank can be opened, then sediment samples from the interior will be collected for laboratory analysis unless the material is not representative of the septic system (e.g., sandy gravel fill).

Utilities beneath the cement sidewalk adjacent to Septic Tank 6 will likely prevent hand augering to the west of this tank when attempting to locate its leach lines. All other procedures specified in Section 2.1.2.2 for exploration and sampling will be applied to Septic Tank 6 except that no QA/QC split samples and equipment blanks will be collected. One QA/QC split sample and one equipment blank will be collected for every 10 samples collected for laboratory testing. This protocol is fulfilled by collecting these types of samples in association with sampling at Septic Tanks 1 and 3.

2.2 Radium Seepage Trench

Data gaps investigation field activities at the Radium Seepage Trench will consist of the following:

- Underground utility clearance, and,
- Exploration trenching and sampling.

2.2.1 Underground Utility Clearance

Underground utility clearance will be performed prior to exploration trenching. UC Davis personnel will locate utilities and mark the ground surface to indicate the type and orientation of the utilities at the trench location. This procedure will minimize the potential for accidental encounters with underground utilities.

2.2.2 Exploration Trenching and Sampling

This section describes exploration trenching and sampling activities that will be performed to assess the northern extent of the radium seepage trench within OU-2.

2.2.2.1 Radium Seepage Trench

Exploratory trench T2 will be excavated to locate and sample the radium seepage trench that may extend north of the northern dry well (Figure 2). The approximate length of trench T2 will be 10 ft and the depth will be less than 15 ft. The 15 ft length of trench T2 is believed sufficient to determine whether the seepage trench north of the northern-most dry well exists, and if found, to properly locate the most representative sample collection locations.

Exploratory trenching will be performed according to SOP 1.0, Exploratory Trench Excavation (Appendix A). Photographs and written logs of each trench will be made to document the materials encountered in accordance with SOP 1.0, Exploratory Trench Excavation, and SOP 3.0, Logging of Soil - Visual USCS (Appendix A). The materials from the trenches will be screened in the field for VOCs using a PID and for radiologic activity using a GM and SCIN to guide the selection of waste and soil samples for laboratory testing and assure field worker safety. Soil samples will be collected at discrete depth intervals to assess the vertical distribution of laboratory test parameters in trench T2. One QA/QC split sample and one equipment blank will be collected for every 10 samples collected for laboratory testing. This protocol is fulfilled by collecting these types of samples in association with sampling at Septic Tank 1 and 3.

Collection of soil samples from trench T2 will involve placing soil from the backhoe bucket into pre-sterilized glass sample jars using pre-sterilized disposable scoops. Sample handling, packaging, and shipping are described in SOP 2.0 (Appendix A). One sample set will be collected from trench T2 and will consist of:

- One native soil sample from immediately below the seepage trench;
- One native soil sample 2.5 to 5 feet below the first sample;
- One native soil sample 7.5 to 10 feet below the first sample;
- One QA/QC split sample; and
- One equipment blank.

Table 2-1 summarizes the number and type of samples that will be collected. Table 4-1 summarizes the chemical and radiological parameters for which these samples will be tested by the contract laboratory.

Following excavation and sampling, for which the trenches will be backfilled with the same material that was removed during trenching. Every effort will be made to return the leach line material to the same level from which it was removed. In locations where trenches were made through asphalted roadways or cemented sidewalks, trenches will be backfilled to grade and cultural features replaced. Any removed asphalt or concrete will be surveyed with the appropriate radiological instruments and disposed or recycled in an appropriate manner.

Table 2-1. Data Gaps Investigation Soil Samples (Minimum Requirements)

Operable Unit	Exploratory Trenches		Hand Auger Soil Borings		Resonant Sonic Coring		Septic Tank Sediment	
	No. of Trenches	No. of Lab Test Samples	No. of Borings	No. of Lab Test Samples	No. of Corings	No. of Lab Test Sample	No. of Locations	No. of Lab Test Samples
Radium Leach Systems	1	3 (1)	-	-	-	-	-	-
Domestic Septic Tanks	2	3 (1)	27	8 (4)	4	4	5	3
Equipment Blanks	-	1	-	1	-	1	-	-
QA/QC Samples	-	1	-	1	-	1	-	-
Estimated Totals	3	8	27	10	4	6	5	3

Notes:

Estimated Total No. Lab Test Samples = 27
( ) Number of sample sets that are represented in the number of lab test samples.
The number of lab test samples x the number of sample sets = the number of samples in a sample set.
One QA/QC sample and equipment blank will be collected for laboratory testing for 10% of the samples collected with each sampling method.

3. LAND SURVEY

Following the completion of data gaps investigation field activities, a land survey will be performed to establish coordinates which can be used to locate the confirmed locations of the septic tanks and sample collection points. This survey will locate each feature both horizontally and vertically and to the nearest 1.0 foot and 0.1 foot, respectively. A State of California-licensed land surveyor will do all surveying.

4. SAMPLING ACTIVITIES

This section describes the sampling analysis and procedures to be used during the data gaps investigation. Soil sample collection will be conducted in accordance with SOP 4.0, Surface/Subsurface Sampling in Appendix A. Sample chain-of-custody records will be prepared in accordance with SOP 6.0, Chain of Custody, in Appendix A. Sample handling, packaging, and shipping will be conducted in accordance with SOP 2.0, Sample Handling, Packaging and Shipping, in Appendix A. Samples will be collected from appropriate locations as described in Section 2.0.

4.1 Chemical and Radiological Analysis

Table 4-1 summarizes the chemical and radiological analyses that will be performed on samples collected during the data gaps investigations field activities.

4.2 Sampling Methodology

The minimum numbers of samples to be collected in each of the areas assessed in this investigation are described in Section 2.0 and shown on Table 2-1. The exact location of each sample will be determined in the field based on the location of utilities and other obstructions.

4.3 Sample Documentation

The usability of the data obtained during this investigation will depend on its quality. A number of factors relate to data quality. Sample collection methods are as important to consider as the methods used for sample analysis. Properly following procedures for both sample collection and analysis reduces sampling and analytical error. To ensure sample integrity, samples will be handled using complete chain-of-custody (COC) documentation and preserved using proper sample preservation techniques, holding times, and proper shipment methods. Obtaining valid and comparable data also requires adequate QA/QC procedures and documentation.

The components of the sample documentation and custody system will include the following:

- COC Form,
- Field Logbook,
- Sample Numbers,

- Sample Labels, and
- Sample Seals.

4.3.1 Chain-of-Custody

COC forms will be completed by the sample team members to track sample custody as well as to specify the requested analyses. COC forms will be completed in accordance with the requirements of SOP 6.0, Chain of Custody, provided in Appendix A.

4.3.2 Field Logbook

Descriptions and observations made during field and sampling activities will be documented in the Field Logbook. The following will be recorded in the Field Logbook:

- Project name and number,
- Location of site,
- Purpose of sampling,
- Description of field activities,
- Names of sampling personnel,
- Date and time of entries,
- Sample matrix,
- Date and time of sample collection,
- Sample locations, Identification (ID) number and methodology,
- Field observations,
- Results of field measurements, and
- Results of field calibrations for instruments used.

4.3.3 Sample Numbers

All sample numbers will begin with a unique identifier (LEHR) and be numbered sequentially. The matrix of the sample will be identified by a letter in the middle of the sample number such as L-liquid or S-solid. For example, LEHR-S-10 is the tenth solid sample obtained at the LEHR site for this investigation.

4.3.4 Sample Labels

Sample labels will be attached to individual sample containers and will contain the following information:

- Project number,
- Sample ID number,
- Date and time collected,
- Initials of sampler, and
- Requested analytes.

4.3.5 Sample Seals

Sample seals will be used to detect tampering and will be placed over the lid of the container and annotated with the following information:

- Project number,
- Sample ID number,
- Date and time, and
- Initials of sampler.

4.4 Sampling Procedures

The following methodology will be followed to collect the samples described in this work plan.

A sample preparation area will be established adjacent to the sampling site. The sample preparation area will be set up on an elevated work surface such as a table. This work surface will be covered with poly sheeting to minimize the spread of any contamination. The following equipment will then be staged in the vicinity of the work area:

- Spill kit,
- Sample containers,
- Demineralized water,
- Sampling tools,
- Sample seals and custody forms, and
- Preservatives, as required.

Samples will be collected at the locations described in Section 2.0 and summarized on

Table 2-1. Soil sample collection will be in accordance with SOP 1.0 and SOP 4.0 in Appendix A. Soil samples that will be tested for metals will be collected in glass jars. All other samples will be collected in either brass sleeves or glass jars. Commonly, samples obtained through coring will be collected in brass sleeves, and samples obtained with pre-sterilized, disposable trowels will be packed into glass jars. Samples will be analyzed for the parameters listed in Table 4-1. These parameters were derived from integration of existing site data, site use history, and other possible historical site activities.

Table 4-1. Data Gaps Investigation Chemical and Radiological Analyses

Parameter	Method	Radium Leach Systems	Domestic Septic Tanks	Equipment Blanks
Gross Alpha	EPA 9310	●	●	●
Gross Beta	EPA 9310	●	●	●
Tritium	EPA 906.0	●	●	●
Carbon-14	LSC		●	●
Radium-226	EPA 903.1(M)	●	●	●
Strontium-90	EPA 905.0	●	●	●
Americium-241	LAS 0108*	●		
Plutonium-241	LAS 0108*	●		
Gamma Emitters	EPA 901.1	●	●	●
Volatile Organic Compounds	CLP SOW OLM 01.8	●	●	●
Formaldehyde	3500 Modified NIOSH		●	
Semi-Volatile Organic Compounds	CLP SOW OLM 01.8	●	●	●
Organochlorine Pesticides (and PCBs)	CLP SOW OLM 01.8		●	
Nitrate	EPA 300.0	●	●	●
Total Chromium	CLP SOW ILM 02.1	●	●	●
Hexavalent Chromium	EPA 7196	●	●	●
Antimony	CLP SOW ILM 02.1		●	●
Arsenic	CLP SOW ILM 02.1		●	●
Barium	CLP SOW ILM 02.1		●	●
Beryllium	CLP SOW ILM 02.1		●	●
Cadmium	CLP SOW ILM 02.1		●	●

*Laboratory Standard Operating Procedure

Table 4-1. Data Gaps Investigation Chemical and Radiological Analyses (Continued)

Parameter	Method	Radium Leach Systems	Domestic Septic Tanks	Equipment Blanks
Cobalt	CLP SOW ILM 02.1		●	●
Copper	CLP SOW ILM 02.1		●	●
Iron	CLP SOW ILM 02.1		●	●
Lead	CLP SOW ILM 02.1		●	●
Manganese	CLP SOW ILM 02.1		●	●
Mercury	CLP SOW ILM 02.1		●	●
Molybdenum	CLP SOW ILM 02.1		●	●
Nickel	CLP SOW ILM 02.1		●	●
Selenium	CLP SOW ILM 02.1		●	●
Silver	CLP SOW ILM 02.1		●	●
Thallium	CLP SOW ILM 02.1		●	●
Vanadium	CLP SOW ILM 02.1		●	●
Zinc	CLP SOW ILM 02.1		●	●
Anions	EPA 300.0	●	●	
pH	ASTM 4972	●	●	

*Laboratory Standard Operating Procedure

5. QUALITY ASSURANCE

The quality assurance requirements applicable to the majority of the data gaps investigation activities are detailed in the Quality Assurance Project Plan (QAPP), Rev. B, for the environmental restoration activities at the LEHR site (WA, 1997b). This plan is based upon the requirements of DOE Order 5700.6c "Quality Assurance" and QAMS-005/80 (EPA, December 19, 1980) "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans" as they are applicable to the scope of work. Additional task-specific quality assurance requirements are detailed in SOPs 1.0 through 6.0 in Appendix A.

6. DATA MANAGEMENT

Samples collected for laboratory analysis will be analyzed by LAS Laboratories (LAS) in Las Vegas, Nevada. Laboratory report hard copies and electronic files will be forwarded from LAS to Weiss Associates (WA). These results will be validated and transferred to the project database in accordance with procedures described in the QAPP (WA, 1997b).

Data receipt, sample tracking, data entry, data storage, and data reporting will be managed by WA according to the procedures defined for these activities in the LFI Work Plan (IT, 1996).

The Data Quality Objectives (DQO) presented in this section were prepared according to EPA document number EPA5440-R-93-071, Data Quality Objectives Process for Superfund, Interim Final Guidance, where applicable.

6.1 Statement of the Problem

The collection of the environmental data specified in this Work Plan will be used in the preparation of an Engineering Evaluation/Cost Analysis (EE/CA). The domestic septic tanks and radium seepage trench have been targeted for environmental investigation in an attempt to supplement the limited information presently available about them. Previous environmental data collection activities at LEHR either were not designed to address these targets or were significantly hampered by lack of reliable information about septic tank locations, availability of accurate engineering or construction records, and/or placement of underground utilities and buildings.

It is anticipated that successful completion of the activities described in this Work Plan will provide sufficient data to complete the EE/CA. Resources available to gather the necessary environmental data include the following.

- Activities outlined in this Work Plan.
- Information included in the Draft Site Characterization Summary Report for the U.S. Department of Energy Areas at LEHR (WA, 1997).
- Information obtained through the completion of the Limited Field Investigation Work Plan (IT, 1996).
- Various environmental reports previously prepared during the LEHR environmental restoration.
- Various drawings prepared by the UC Davis Facilities Engineering Department.

- Results of underground utility survey that will be performed by UC Davis facilities engineers prior to the onset of the activities proposed in the Work Plan.
- Anecdotal information gathered from long-term UC Davis facilities engineers.

6.2 Identification of Decisions

The need to perform a comprehensive EE/CA for the LEHR environmental restoration program requires the collection of the environmental data specified in this Work Plan. In addition, possession of the expected resultant data may also serve other program efforts like the removal action risk evaluation; risk management; and establishment of clean-up goals and activities.

The primary use of the data expected to result from completion of this Work Plan is to provide information useful in producing a sound EE/CA. The data will be used to assess the nature and extent of contamination in the vicinity of the domestic septic tanks and the radium seepage trench; potential threat to ground water posed by the contamination; and contamination clean-up requirements, methods, costs, and schedules.

6.3 Identify Inputs to Decisions

The information needed to assess the potential subsurface impact that contaminants associated with the domestic septic and radium treatment systems may have made at LEHR and to support the development of the EE/CA include:

- Location of septic tanks and their associated leach lines.
- Presence, location, and dimensions of the radium seepage trench.
- Presence, identity, concentration/activity, and spatial relationships of contaminants present in the septic tanks and in soils within the immediate vicinity of septic tank leach lines and the radium seepage trench.
- Septic tank, septic tank leach lines, and radium seepage trench construction materials identity, quantity and condition.

Environmental measurement inputs required to make the intended subsurface assessments and to support the development of the portions of the EE/CA that will address the domestic septic tanks and radium seepage trench include:

- Three-dimensional sample collection locations.
- Sample medium described using the USCS classification method.
- Analyte or radionuclide identity and concentration/activity.
- Equipment rinseate sample analysis.
- Background area measurements made with field screening instruments.

- Length, width, depth, and thickness measurements that can be made relative to the septic tanks, septic tank leach lines, and the radium seepage trench.
- Construction material identities, quantity, and condition that can be made relative to the septic tanks, septic tank leach lines, and the seepage trench.
- Laboratory data validation results.

6.4 Definition of Study Boundaries

The spatial and temporal aspects of the environmental media that the data must represent are presented below:

- Sediment samples will be collected for testing from within the domestic septic tanks only if the tanks contain material typical of the designed use of the tank. For example, if the tanks contain introduced materials like sandy gravel, then no sample will be collected.
- Soil samples will be collected immediately below leach lines or seepage trench, 2.5 to 5.0 and 7.5 to 10 feet below the first sample in order to assess vertical migration of contaminants and the potential threat to ground water posed by contaminants. In addition, the spatial distribution of contaminants will be useful in determination of clean-up procedures and goals (i.e., volume of material that may require removal, cost to remove material).
- Equipment rinseate samples that will be analyzed for hexavalent chromium must be tested within 24 hours of collection.
- Samples that will be analyzed for nitrate will be analyzed within 48 hours of collection.
- Soil samples that will be analyzed for hexavalent chromium, anions, and pH must be tested within 3 days of collection.
- Samples that will be analyzed for VOC, semi-volatile organic compounds, formaldehyde, and organochlorine pesticides, must be tested within 14 days of collection.
- Samples that will be analyzed for radionuclides and metals must be tested within 6 months of collection.

6.5 Development of Decision Rules

Conditions that may cause deviation to the proposed Work Plan activities include:

- Inability to locate a domestic septic tank;
- Obstructions or utilities that prevent opening a domestic septic tank;
- Inability to locate a septic tank leach line;
- Observations during exploration trenching that indicate the radium seepage

trench does not extend north of the northernmost radium-226 treatment system dry well;

- Inability to collect a desired sample; and,
- Field screening measurements indicate the work environment, or some aspect of it, is unsafe for human or environmental health and/or welfare.

Furthermore, real time decisions to continue to locate a septic and its associated leach fields will be determined on a case-by-case basis and will be governed by:

- Field observations;
- Schedule;
- Cost; and,
- Accessibility.

6.6 Specification of Limits on Decision Errors

The project field coordinator is the front-line decision-maker during the in-field data gathering activities. Field coordinator authority to deviate from the proposed Work Plan extends to conditions that are clearly insurmountable. The field coordinator must consult the project manager when faced with conditions that may allow work to progress with caution. The project manager may, in turn, consult UC Davis engineers, project team members and personnel with personal site knowledge, and/or U.S. Department of Energy (DOE) personnel to facilitate decision-making.

6.7 Optimization of Investigation Design for Obtaining Data

The most effective sampling and analysis design for generating data expected to satisfy task DQO were selected during planning and are presented in this Work Plan. Sampling methods and procedures were selected with expediency, waste minimization, cost control, completion schedule, and analytical parameters in mind. These selections also benefited from assessment of previous environmental data collection activities at LEHR.

6.8 Sampling Process Design

The rationale for sample collection at each of the subject work areas is to provide the minimum environmental data necessary to assess the following:

- Whether the domestic septic and radium treatment systems have contributed to subsurface contamination at LEHR;
- The nature, distribution, and quantity of subsurface contamination resulting from the use of the domestic septic and radium treatment systems;
- The vertical migration of contaminants in the vadose zone; and,

- The potential threat to ground water posed by the contaminants.

In addition, the rationale for sample collection at each of the subject work areas is expected to provide information useful in completing the following LEHR project activities:

- Preparation of the EE/CA, and
- Preparation of the pending removal action risk evaluation.

6.8.1 Sampling Network Design

The sampling network design is engineered to assess whether subsurface contamination was released by suspected sources (i.e., domestic septic tanks, septic tank leach lines, and radium seepage trench). In addition, contaminant identities and concentrations or activities when considered in relation to sample collection location will facilitate assessment of (vertical) migration within the vadose zone and potential threat to groundwater.

Sample collection locations will be determined in the field based on the observed/determined location of the domestic septic tanks, their leach lines, and the radium seepage trench. The proposed procedures to locate these targets include hand augering and backhoe excavation. Section 2.0 in this Work Plan discusses how these approaches will be employed at each targeted work area.

6.8.2 Types of Samples and Sampling Matrices

Samples collected from within septic tanks will be comprised of sediment correlative with septic tank usage. Samples collected from below septic tank leach lines and the radium seepage trench will be comprised of native soils. Samples collected as equipment rinseate blanks will be liquid water. Section 2.0 and Table 2-1 in this Work Plan provide detailed information regarding sample types that are required.

6.8.3 Sampling Frequencies

Section 2.0 of this Work Plan specifies that one sample set will be collected at each specified location. Each sample set is comprised of several or more samples that may include native soil, QA/QC duplicate, and equipment rinseate samples. Sample sets for each location are defined in Section 2.0 of this Work Plan. Sample locations include each domestic septic tank, one leach line associated with each septic tank, and the radium seepage trench.

6.8.4 Measurement Parameters of Interest

Measurement parameters that will be recorded, if possible, in the completion of the proposed activities in this Work Plan include the following:

- Soil type defined using the USCS classification method.

- Sample collection locations recorded by depth and northing and easting coordinates.
- Septic tank dimensions and depth tank top.
- Septic tank leach line locations, depths, and thicknesses.
- Radium seepage trench location, depth, and thickness.

7. INVESTIGATION-DERIVED WASTE MANAGEMENT

Data gaps investigation activities with the potential to generate investigation-derived wastes (IDW) include exploration trenching, hand augering, and resonant sonic coring (i.e., drilling). The method and type of waste generation associated with trenching is described in detail in Sections 3.1 and 3.2 of Appendix D, Final Draft Waste Management Plan for Investigation Derived Wastes, in the RI/FS Work Plan (Dames and Moore, 1994). The management of IDW in the proposed work plan is in accordance with United States Environmental Protection Agency (US EPA) document "Management of Investigation Derived Waste During Site Inspections" (US EPA, 1991), and the United States DOE Order 5820.2a, "Radioactive Waste Management." The approach to IDW management in the work plan focuses on protecting human health and environment while applying the Area of Containment (AOC) unit concept (US EPA, 1991) for each of the investigation areas. This concept or approach involves leaving a site in a condition no worse than that which existed prior to the investigation, minimizing the quantity of generated wastes, and leaving wastes on-site that do not require off-site disposal or extended above ground containerization.

7.1 Exploratory Trenching

During excavation of each exploratory trench, materials will be segregated as soil cover, native soil, and waste and stockpiled on plastic sheeting. Upon completion of the trench and review of field screening results, listed in Table 7-1, excavated material will be placed in approximately the same areas and depth from which they were excavated. If warranted, waste material will be placed between sheets of plastic sheeting to facilitate later retrieval for treatability studies. There are no standardized compaction requirements, however, backfill material will be "bucket-compacted" with the backhoe. If isolated contained waste is encountered during excavation, it will be removed and disposed in an appropriate manner based on waste stream characterization.

7.2 Subsurface Soil Sampling

Shallow soil sampling by hand augering creates low waste volumes. Upon completion of the hand augered borehole and review of the field screening results, the borehole will be backfilled with the material removed from it. Deep soil sampling by resonant sonic coring also creates minimal waste volumes. Upon completion of the corehole and review of the field screening results, unused core material will be placed in a shallow trench immediately adjacent to the point of origin. The exception will be unused core associated with Septic Tank 5. All surfaces immediately adjacent to Septic Tank 5 are paved. Therefore, core material from Septic Tank 5 will be placed in the shallow trench made immediately adjacent to Septic Tank 6. The management of these IDW is discussed in Section 4.0, On-site Management and Storage of IDW, in the RI/FS Work Plan (Dames and Moore, 1994). In addition, Sections 3.0 (in part), 4.0, 5.0, and 6.0 of Appendix B, Waste Management Plan for Investigation Derived Waste, in the RI/FS work plan (Dames and Moore, 1994) are applicable to sampling subsurface soil.

7.3 Decontamination Solutions

Decontamination solutions will consist of water used to clean the backhoe bucket, sample collection tools, and personnel wash water. When possible, preliminary decontamination will be conducted so that the sediment and rinseate from trenching and subsurface sampling equipment will be discharged into a shallow depression in the area where it was generated unless screening indicates that elevated radioactivity or organic vapors could pose a threat to health and the environment from such placement (Table 7-1). The management of these IDW is discussed in Section 4.0, On-site Management and Storage of IDW, in the RI/FS work plan (Dames and Moore, 1994).

Table 7-1. Interpretation of field evaluation of IDW

FIELD EVALUATION METHOD	EVALUATION FREQUENCY	RESULTS INDICATING CONTAMINATION REQUIRING CONTAINERIZATION
Odor	Continuous when in the presence of excavated material and not wearing respiratory protection	Chemical odor that is not associated with natural environmental processes
Color	Continuous in the presence of excavated material	Staining or discoloration not associated with natural environmental processes.
Radiation Meter	Borings with cores: maximum of every 5 ft. Hand auger cuttings only; approximately every 3 to 5 feet	Readings if 48 μR/hr[1] above background[2] after meter is calibrated.
Organic Vapor Analyzer (PID)	Borings with cores: maximum of every 5 ft. Borings with cuttings only; approximately every 3 to 5 feet	Readings above 5 ppm[3] in the breathing space above background after meter is calibrated.

Notes:

1 48 μR/hr corresponds to 100,000 μR/year dose limit for visitors and public (100,000μR/year/2080 hours/year) (DOE, 1992).
2 Background values for alpha and beta/gamma activities will be calculated by collecting five measurements at each of four locations and adding two standard deviations to the mean of the 20 readings.
3 Criteria based on anticipated contaminants and their respective Permissible Exposure Limits (PELs).

8. HEALTH AND SAFETY CONSIDERATIONS

Health and safety procedures that will be followed during Data Gaps Investigation field activities are provided in the Project Health and Safety Plan (PHSP) (WA, 1997c). A hazard analysis for these activities as well as specific additional control measures to be followed are described in section 8.1. Specific sections describing hazard analysis and control from the PHSP have been included where applicable.

8.1 Hazard Analysis

The job hazard analysis identifies potential safety, health and environmental hazards and provides for the protection of personnel, the community, and the environment. A conservative approach will be taken to ensure that excavation and sampling safety concerns are met. During excavation and sampling activities, the Field Coordinator (FC), Site Health and Safety Officer (SHSO), or Health and Safety Coordinator will monitor the site for any changes in conditions that would require modification of work conditions (i.e., personal protection equipment [PPE]). In the event that changes arise in radiological or industrial health and safety conditions, this work plan will be modified in accordance with the procedures contained in Standard Quality Procedure 11.1 (SQP), "Field Work Variances/Request For Information" (WA, 1997d).

8.1.1 Underground Utilities

UC Davis personnel will clear utilities prior to exploration trenching, hand augering, and drilling activities as described in Section 2.1.1. I should be noted, however, that the potential of accidentally encountering unmarked or mislocated underground utilities during the proposed field sampling activities still exists. In order to prevent encountering and/or to minimize the dangers associated with accidental encounters with underground utilities the following precautions will be followed during field sampling activities. These include:

- Locating the main shutoff valve(s) or switch(es) for gas lines, water lines, and electric lines at each sampling location;
- Hand augering the first 5 ft. of each boring. After utilities are cleared, shallow soil samples will be collected using a hand auger.

Hand augering is one of the least intrusive and safest sampling methods that can be employed to sample soils in areas containing utilities.

In the event a utility is encountered with a hand auger, no damage to the utiltiy would be expected. Proposed, deeper sonic core samples will be collected in select previously hand augered holes, to insure no utilities are encountered.

8.1.2 Confined Space Entry

Confined space entry will not be required during the performance of any excavation or sampling activities. All activities have been planned such that the excavations will not be entered.

8.1.3 Radiological Exposure

The waste materials to be encountered may contain low-level radioactive material from prior animal research activities. The predominant nuclides used during these activities were radium-226 and strontium-90. Excavation and sampling activities may present a risk of radiological exposure to personnel through direct exposure to radioactive materials as well as through ingestion and inhalation. Personnel in the vicinity of the excavation shall wear modified Level D PPE as described in Section 8.2.4.

8.1.4 Chemical Exposure

During excavation and sampling activities, grab samples and direct instrumentation (PID, GM) will be used to detect the presence of hazardous chemicals and radioactivity.

8.1.5 Heat Stress

This work activity is scheduled to be performed at a time when workers may be affected by heat related injuries. Heat stress may be a concern due to the open nature of the work area and the time of year (May/June) at which activities are scheduled to be performed.

8.2 Hazard Controls

The following control measures will be implemented during these activities. These control measures are intended to supplement the PHSP.

8.2.1 Hazardous Work Permit

A Hazardous Work Permit (HWP) will be used to control work in the exclusion zone. The HWP will be issued in accordance with the procedures specified in the HASP (WA, 1997b). The following information will be described in the HWP:

- Scope of work to be performed,
- Anticipated radiological, safety, and industrial hygiene conditions,
- PPE and respiratory protection requirements,
- Radiological and industrial hygiene monitoring requirements,

- Dosimetry requirements,
- Activity Hazard Analysis,
- Period for which the HWP is valid, and
- Additional requirements for entry.

8.2.2 Boundaries

The work areas will be enclosed by boundary ropes or ribbons supported with stations. The placement of the stations and boundaries will be controlled by the FC to facilitate access to the work area for equipment. The boundaries will enclose the work area as well as the support zone. Boundaries of the contamination area (CA) will be posted with signs stating "Contamination Area, Authorized Personnel Only."

8.2.3 Heat Stress

To minimize the effects of heat related injuries, an area will be established to conduct entrance/exit activities, sample preparation and other support functions. This area will be covered with a portable tarp to provide the workers with shade. The controls associated with heat stress are specified in the PHSP. The SHSO shall ensure that all workers are aware of the signs and symptoms of heat stress, engineering control measures, and the need to replenish body fluids during morning tailgate safety meetings (TSMs). Integrated heat stress monitoring will be performed daily to determine the proper work/rest regiment.

8.2.4 PPE

Workers in the exclusion zone will wear modified Level D PPE in accordance with the PPE selection matrix in the PHSP.

Modified Level D PPE will consist of:

- Hard hat, American National Standards Institute (ANSI) approved,
- Steel-toed impermeable Poly Vinyl Chloride (PVC) boots,
- Tyvek hooded coveralls,
- Chemical resistant gloves,
- Full tape of wrists, ankles, and hood, and
- Leather work gloves.

8.2.5 Training

Personnel performing activities associated with the data gaps investigation will receive training covering this work plan. All on-site project personnel shall have completed at least 40 hours of hazardous waste operations-related training, as required by Occupational Safety and Health Administration (OSHA) Regulation 29 CFR 1910.120. All field employees receive a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor. Those personnel who completed the 40-hour training more than 12 months prior to the start of the field activities shall have completed an 8-hour refresher course within the past 12 months. The FC shall have completed an additional 8 hours of relevant supervisory health and safety training. In addition, any workers who will enter radiological control zones shall have successfully completed Radiological Worker II training and site-specific Radworker training. All site workers shall receive training covering the Contingency Plan and General Emergency Response Procedures (WA, 1997e). Personnel performing activities within the contamination area will receive the training in accordance with the requirements specified in SQP-3.2, "Indoctrination and Training" (WA, 1997d), for the specific job assignments.

8.2.6 Buddy System

The buddy system will be utilized to protect personnel in the work area. The system will be implemented in the following manner:

- At least two persons will be required to be in the work area when work is conducted in the exclusion zone, which might result in worker contamination or injury.

The buddy system is a method of organizing employees into work groups and is designed to provide those employees with assistance when needed. Each employee in a work group is designated to be observed by at least one other person. Assignment of designated partners should take place during the TSM.

The responsibility of the buddy is to:

- Provide assistance, if needed;
- Maintain line of sight contact or verbal contact with workers in the CA;
- Observe for signs of chemical or physical trauma or heat stress such as:
  - changes in complexion and skin discoloration,
  - changes in coordination or demeanor,
  - excessive saliva and pupillary response,
  - changes in speech pattern;
- Periodically verify the integrity of all protective clothing; and,
- Notify the Project FC if emergency help is needed.

Entry to or exit from the CA under the conditions described earlier without a designated partner is prohibited.

8.2.7 Safety Equipment

In addition to other equipment specified in this work plan, the following safety equipment will be staged at the boundary of the CA:

- First aid kit;
- Portable eyewash station and hand shower;
- Hearing protection;
- Spill kit;
- Air horn;
- Portable radio for emergency communications; and
- Fire extinguisher.

8.2.8 Air Monitoring

Air monitoring is essential to ensure that all field personnel will be adequately protected from airborne contaminants. The levels of organic vapors in the work area will be monitored using a PID when the potential for these contaminants is present.

General area air samples will be continuously collected to monitor airborne radioactive contaminant levels when excavating exploratory trenches. Filters will be changed at the beginning of each workday. The filters will be analyzed on-site in a low-background area using a gross alpha/beta scaler counter (i.e., dual channel scaler). Filters will be counted initially after removal and at the start of the next working day shift. Air monitoring will be conducted in accordance with procedures for air surveillance program and airborne radioactivity monitoring in the PHSP.

If the general area air samples indicate that workers may be exposed to airborne radioactive contaminants that are >10% of the derived air concentration (DAC), listed in 10 CFR 835, Appendix A, then estimated radioactive material internal exposures will be made by the site health and safety officer for each worker. These estimates will be determined by calculating DAC-hours. Calculated results will be incorporated with dosimetry records. Workers that receive greater than two DAC-hours per day or ten DAC-hours per week will be subjected to bioassay testing.

The radionuclides of concern and their respective DACs are provided below:

- Strontium-90; 2E-9, and
- Radium-226; 3E-10.

9. REFERENCES

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DRAWN BY	PAC 4-21-97	CHECKED BY	JM 4-21-97	DRAWING NUMBER	770529-A5
		APPROVED BY	WES 4/21/97		

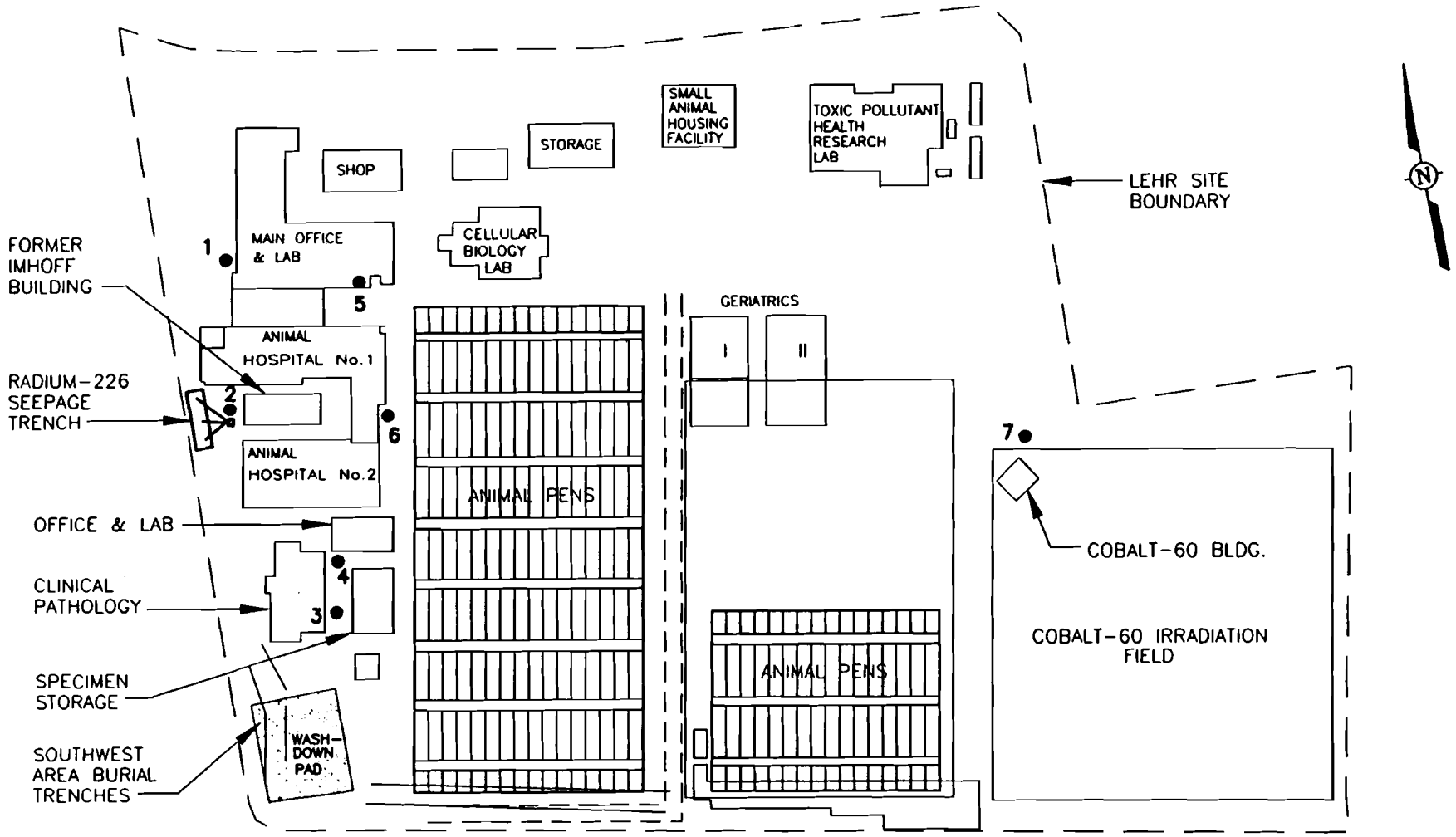


FIGURE 1

APPROXIMATE LOCATIONS OF DOMESTIC SEPTIC TANKS AND RADIUM-226 SEEPAGE TRENCH AT THE LEHR FACILITY DAVIS, CALIFORNIA

LEGEND

1● APROXIMATE LOCATION DOMESTIC SEPTIC TANK AND TANK NUMBER

APPROXIMATE SCALE

0 150 300 FEET

LE-LL29(LE5)

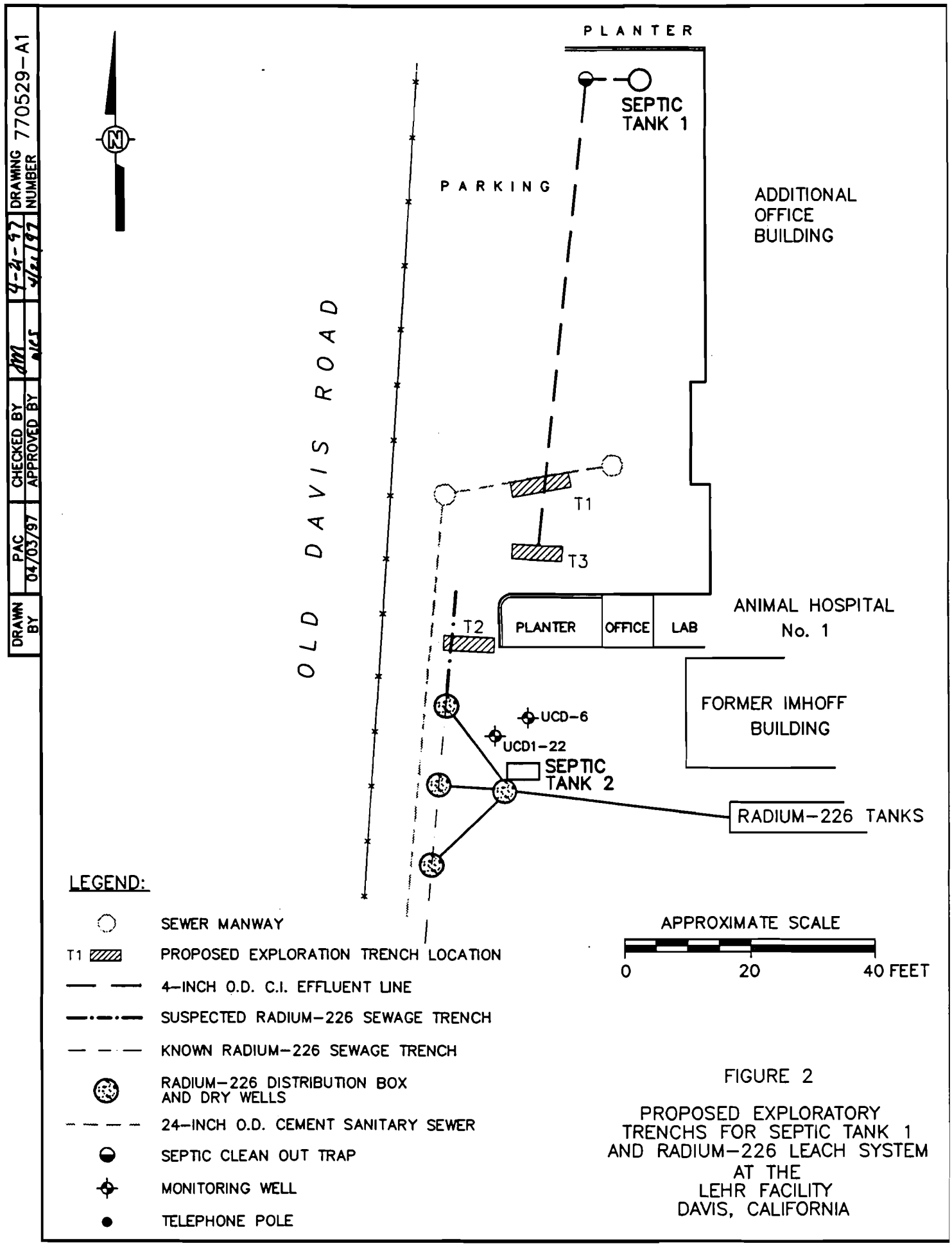
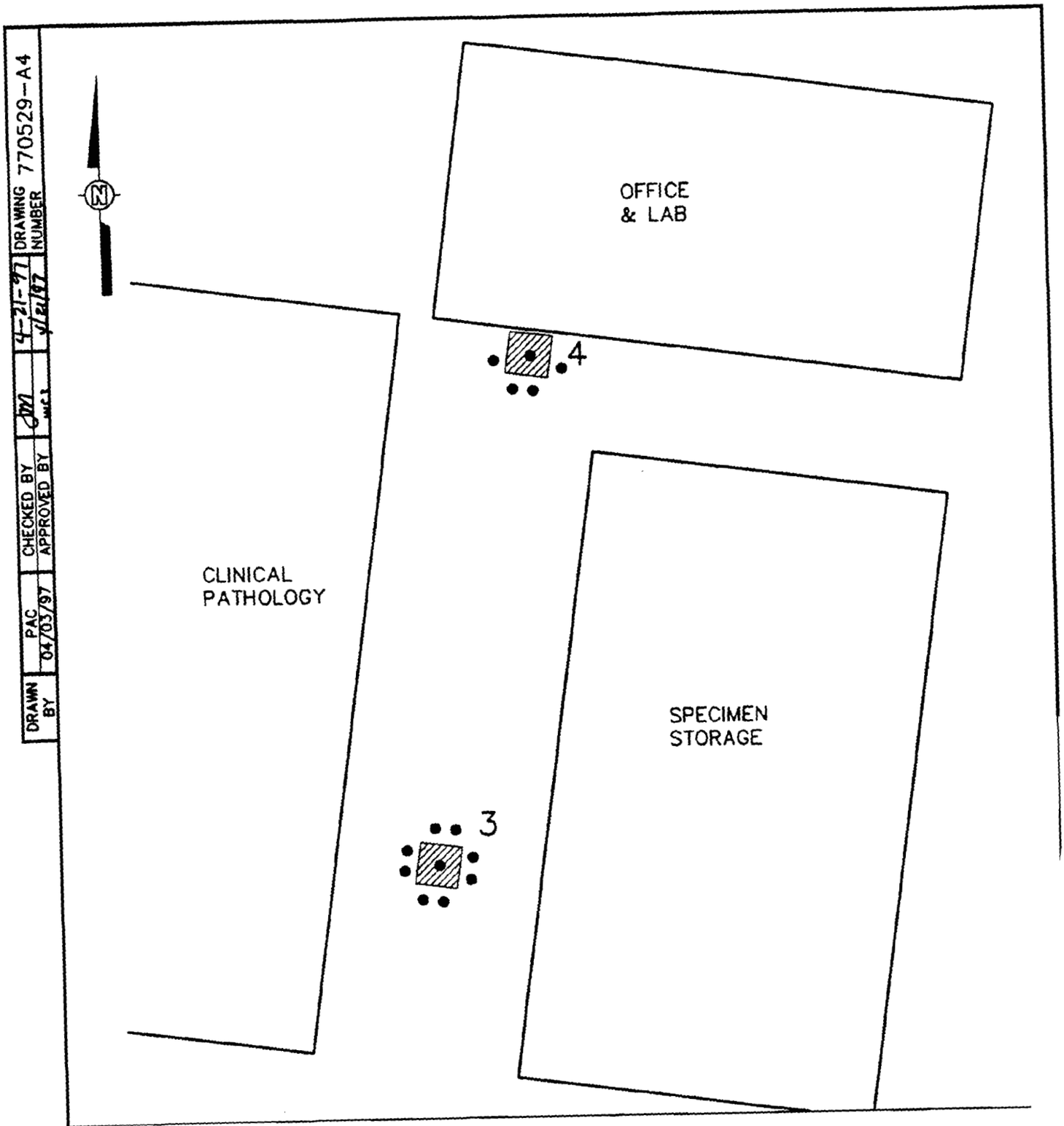


FIGURE 2

PROPOSED EXPLORATORY TRENCHS FOR SEPTIC TANK 1 AND RADIUM-226 LEACH SYSTEM AT THE LEHR FACILITY DAVIS, CALIFORNIA

LE-29A1(LE5)



LEGEND:

● PROPOSED HAND AUGER LOCATION

3 APPROXIMATE LOCATION OF SEPTIC TANKS 3 AND 4

APPROXIMATE SCALE

8 16 FEET

FIGURE 3

PROPOSED HAND AUGEF LOCATIONS FOR SEPTIC TANKS 3 AND 4 AT THE LEHR FACILITY DAVIS, CALIFORNIA

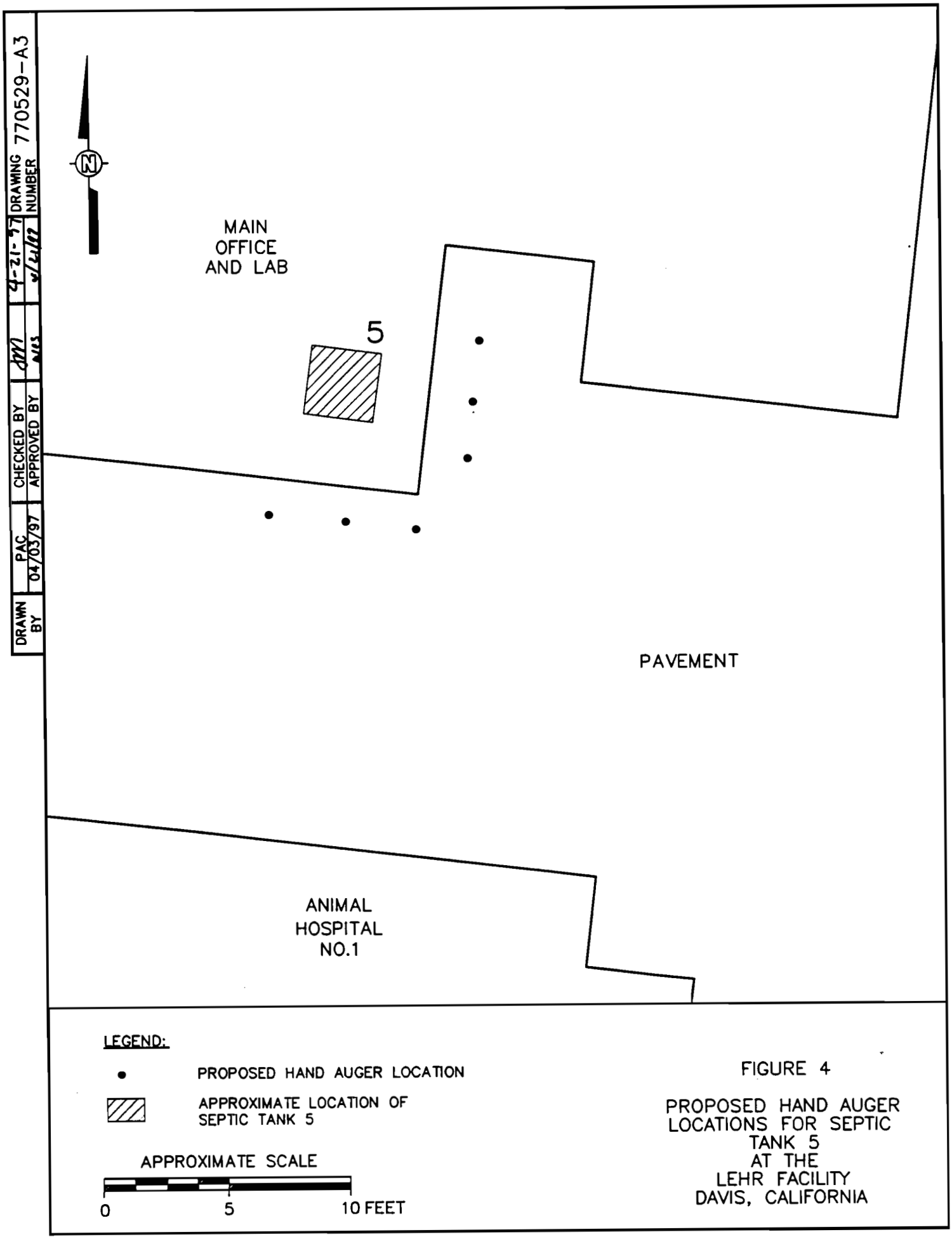
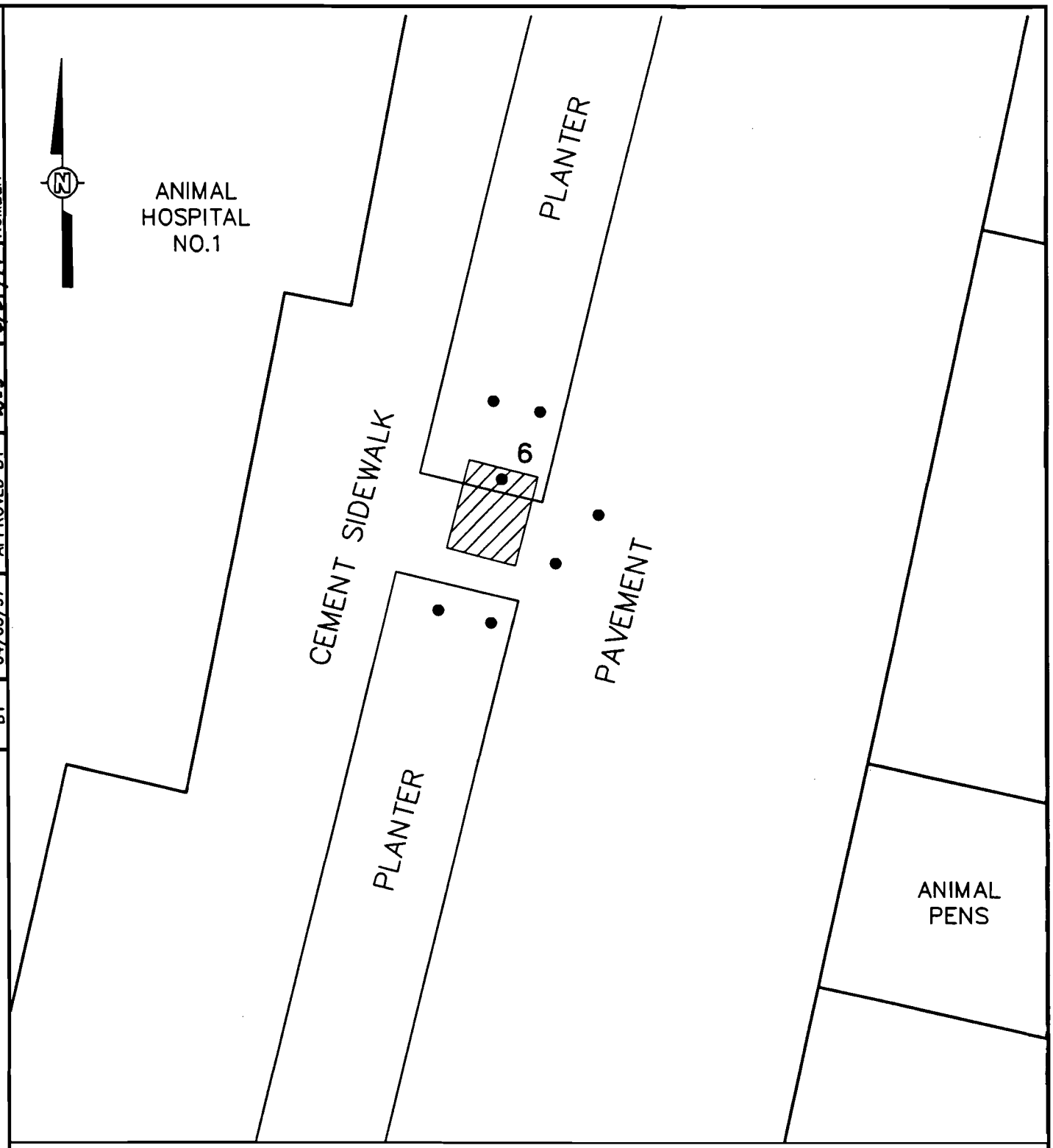


FIGURE 4

PROPOSED HAND AUGER LOCATIONS FOR SEPTIC TANK 5 AT THE LEHR FACILITY DAVIS, CALIFORNIA

LE-29A3(LE5)



DRAWN BY	PAC 04/03/97	CHECKED BY	dm 4-21-97	DRAWING NUMBER	770529-A2
		APPROVED BY	WCS 4/21/97		

LEGEND:

- ● PROPOSED HAND AUGER LOCATION
- ▨ APPROXIMATE LOCATION OF SEPTIC TANK 6

APPROXIMATE SCALE

0 8 16 FEET

FIGURE 5

PROPOSED HAND AUGER LOCATIONS FOR SEPTIC TANK 6 AT THE LEHR FACILITY DAVIS, CALIFORNIA

LE-29A2(LE5)

APPENDIX A

STANDARD OPERATING PROCEDURE

1.0 Exploratory Trench Excavation

2.0 Sample Handling, Packaging, and Shipping

3.0 Logging of Soil – Visual USCS

4.0 Surface/Subsurface Sampling

5.0 Borehole Sampling

6.0 Chain-of-Custody

EXPLORATORY TRENCH EXCAVATION

STANDARD OPERATING PROCEDURE

1.0 Purpose

This procedure establishes guidelines and methodologies to be used in excavation and logging of exploratory trenches. Resulting excavations can be used for shallow stratigraphic description and sample collection for physical and chemical testing. Included in this procedure are descriptions of equipment, forms, and set-up activities. Additional specific procedures and requirements will be provided in the Data Gaps Investigation Work Plan.

2.0 References

2.1 SOP 2.0 - Sample Handling, Packaging, and Shipping (Appendix A)

2.2 SOP 3.0 - Logging of Soils - Visual USCS

2.3 SOP 4.0 - Surface/Subsurface Sampling (Appendix A)

2.4 HSP-61 - Excavation and Trenching (Appendix E). *Work Plan for the Decontamination and Decommissioning of the Imhoff Building, Cobalt-60 Building, and Tank Trailer at the Laboratory for Energy Related Health Research, University of California at Davis*, IT Corporation, 1994.

3.0 Procedures

This section contains both the responsibilities and procedures involved with exploratory trench excavations. Proper procedures are necessary to assure worker health and to assure the quality and integrity of collected samples. The details within this SOP will be used in conjunction with the Work Plan. The Work Plan will generally provide the following information:

- Sample collection objectives;
- Locations and depths of samples to be collected;
- Numbers and volumes of samples to be collected;
- Types of analyses to be conducted for the samples;
- Specific quality control (QC) procedures and sampling required; and
- Any additional shallow subsurface sampling requirements or procedures beyond those covered in this SOP, as necessary.

At a minimum, the procedures outlined below will be followed.

3.1 Responsibilities

3.1.1 The Field Coordinator will be responsible for ensuring that all sample collection activities are conducted in accordance with this SOP and any other appropriate procedures. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

3.1.2 The Project Quality Assurance Specialist (PQAS) will be responsible for periodic review of field generated documentation associated with this SOP. The PQAS will also responsible for implementation of corrective action (i.e., retraining personnel, additional review of work plans and procedures, variances to QC sampling requirements, issuing nonconformances, etc.) if problems occur.

3.1.3 Field personnel assigned to sampling activities will be responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff will be responsible for reporting deviations from procedures to the Field Coordinator, IT Project Manager, or the PQAS.

3.2 Set Up Procedures

Set-up procedures and trench excavations will be conducted under the supervision of the Field Coordinator and field geologist. These personnel are responsible for:

- Identifying each trench location;
- Confirming the trench location; and
- Obtaining proper clearance for potential above- and below-ground hazards.

Prior to trench excavation, the sampling tools should be decontaminated. The work area will be well-marked with barricade tape. In some cases, special arrangements may need to be made to penetrate surface paving (concrete or asphalt). Each trench will be backfilled following logging and photographing as described in the Work Plan.

3.3 Excavation Procedures

This section provides a brief description of excavation procedures. Trenching procedures described below adhere to guidelines and requirements of Title 8 CCR, Article 6, Sections 1541 and 1542, and the Health and Safety considerations specified in the Work Plan.

Following excavation location approval, the trench will be excavated using a backhoe. The standard backhoe bucket width is 24 inches, but a larger bucket (36-inch) may be used. The width of the excavation, regardless of the width of the backhoe bucket, will be such that viewing into it is not restricted from the surface. Personnel will not enter these excavations.

Soils will be described as specified in SOP 3.0 (Reference 2.2). The exposed excavation wall(s) will be logged by the field geologist and photographed.

All excavation work will be in accordance with Reference 2.4. Excavations greater than five feet in depth will not be entered and observations for logging purposes will be made from the

surface. In no case will an excavation greater than five feet in depth be entered without proper shoring. If soil samples from greater than five feet are required, samples will be collected from soil in the backhoe bucket taken from the desired depth. Soil sample collection methods are described in SOP 4.0 (Reference 2.3).

Excavations will be backfilled using the backhoe, as explained in the Data Gaps Investigation Work Plan.

4.0 Records

4.1 Records generated as a result of this SOP will be controlled and maintained in the project record files.

SAMPLE HANDLING, PACKAGING AND SHIPPING

STANDARD OPERATING PROCEDURE

1.0 Purpose

This Procedure outlines the methods and responsibilities for field personnel to use in the packaging and shipping of environmental samples, hazardous materials and hazardous waste samples for chemical and physical analysis.

2.0 References

2.1 EPA, September 1987, Compendium of Superfund Field Operations Methods, EPA 540/P-87/001a, OSWER 9355.0-14.

2.2 EPA, August 1988, EPA Guidelines for Conducting Remedial Investigation and Feasibility Studies under CERCLA, Interim Final OSWER Directive 9355.3-01.

2.3 Code of Federal Regulations, DOT 49 CFR parts 100 to 177, Revised October 1, 1992.

2.4 Dangerous Goods Regulations, IATA, January 1, 1994.

2.5 SOP 1.0 - Subsurface Sampling (Appendix A).

2.6 SOP 5.0 - Chain of Custody (Appendix A).

3.0 Definitions

3.1 Environmental Sample

A limited quantity, low concentration sample that does not require Department of Transportation (DOT) or International Air Transportation Association (IATA) hazardous waste labeling as a hazardous waste or material.

3.2 Hazardous Waste Sample

Medium or high concentration sample requiring either DOT or IATA labeling as a hazardous waste or material.

3.3 Hazardous Waste

Any substance listed in 40 CFR Subpart D (260.30 et seq.) or otherwise characterized as ignitable, corrosive, reactive, or toxic as specified in Subpart C (261.20 et seq.) that would be subject to manifest and packaging requirements specified in 40 CFR 262. Hazardous waste is defined and regulated by the Environmental Protection Agency (EPA).

3.4 Hazardous Material

A substance or material in a quantity or form, which may pose an unreasonable risk to health, safety, and/or property when, transported in commerce. Hazardous material is defined and regulated by DOT (49 CFR 173.2 and 172.101) and IATA (Section 4.2).

3.5 Sample

Physical evidence collected from a facility or the environment which is representative of conditions at the point and time at which the sample is collected.

4.0 Procedure

4.1 Responsibilities

4.1.1 Compliance with this procedure is the responsibility of project management, site management, health and safety, and field personnel.

4.1.2 Project Manager - is responsible for the development and review of site-specific work plans which address the specific sample handling, packaging, and shipping requirements for the project. Review the project specific documentation forms to ensure they are appropriate for the field activities.

4.1.3 Field Coordinator (FC) - is responsible for seeing that field personnel receive proper training and maintain quality assurance/quality control (QA/QC). The FC is additionally responsible for approving, coordinating, and supervising all field activities associated with this Work Plan.

4.1.4 Project Quality Assurance Specialist (PQAS) - is responsible for the periodic review of documentation generated during sample handling, packaging, and shipping and the periodic review and audit of field personnel as they perform the work.

If problems arise, the PQAS is also responsible for swift implementation of corrective action (i.e., retraining personnel, additional review of work plans and procedures, variances to requirements, issuing nonconformances).

4.1.5 Health and Safety Officer (HSO) - is responsible for ensuring complete compliance with the Health and Safety Plan by all personnel on site. He is responsible for ensuring all appropriate protective measures are identified and implemented to adequately protect site workers.

4.1.6 Radiological Controls Technician (RCT) - is responsible for assisting the HSO in the performance of monitoring, posting and evaluation of worksite safety and radiological controls conditions.

4.2 Sample Handling

4.2.1 Inspect the sampling containers (obtained from the analytical laboratory prior to the sampling event) to ensure that they are appropriate for the samples being collected, correctly preserved, and undamaged.

4.2.2 When collecting a sample always use approved/site specific personal protective equipment (e.g., gloves, etc.) to prevent cross-contamination from sample to sample but also as a health and safety requirement.

4.3 Field Packaging

4.3.1 Collect the samples in accordance with the site-specific work plans and SOP No. 1 (Appendix A).

4.3.2 As soon as possible after sample collection, tightly seal the container, and place a piece of custody tape over or around the cap. The custody tape should be placed over the cap so that any attempt to remove the cap will cause the tape to be broken. Do not place custody tape over a volatile organic analysis (VOA) vial septum.

4.3.3 Place all containers in separate, appropriately sized, airtight, seam sealing polyethylene bags (e.g., Ziploc™). Seal the bag, removing any excess air.

4.3.4 Place the bagged container inside an insulating shipping container, "cooler." This cooler should have frozen blue ice inside to assure samples remain cool, "4°," during transit from field to the packaging location.

4.3.5 Because blue ice does not maintain the 4°C standard required for sample shipping, it should only be used while in the field collecting samples.

4.3.6 Maintain the samples under chain of custody (COC) in accordance with the Work Plan and SOP 5.0, Chain of Custody (Appendix A).

4.4 Sample Packaging

Environmental samples shall be packaged in the following manner. Additional packaging requirements for samples identified as containing a known hazardous material or hazardous waste are contained in References 2.3 and 2.4. The FC shall determine the appropriate hazard classification and shall identify any additional packaging requirements and ensure that they are completed.

4.4.1 Inspect the integrity of the shipping container. The container is generally a "cooler" constructed of heavy plastic or metal with appropriate insulating properties so that variations in temperature during shipping are minimized. Also make sure that the drain plug has been sealed with nylon reinforced strapping tape or mailing tape.

4.4.2 Place two to four inches of absorbent packaging material (e.g., Vermiculite™) in the bottom of the shipping container.

4.4.3 Carefully check the COC record against the collected sample labels and containers to ensure that the sample numbers, sample description, date and time of collection, container type and volume, preservative, and the required analytical methods are correct and in agreement.

4.4.4 Place the samples in the shipping container, allowing sufficient room between the samples to place ice and/or packing material.

4.4.5 Double bag and seal crushed or cubed ice in heavy-duty polyethylene bags. Place these bags of ice on top of and between samples. Blue ice should not be used for sample shipping; it does not maintain the 4°C temperature necessary for regulatory compliance.

4.4.6 All samples requiring temperature preservation stated at 4°C will be acceptable "as in" within the range of 4°C ± 2°C. The laboratory should record the temperature of receipt upon the COC. For all samples received from 6°C to 10°C, the sample(s) and temperature (in 1°C increments) will be noted on the COC and then analyzed. For samples with temperatures greater than 10°C, the samples will be rejected by the laboratory for analysis and immediately reported to the Project Manager. For VOA samples below 0°C, the samples will be rejected and also reported.

4.5 Sample Shipping

Environmental samples shall be shipped in the following manner. Additional shipping requirements for samples identified as containing a known hazardous material or hazardous waste are contained in References 2.3 and 2.4. The FC shall identify any additional shipping requirements and ensure that they are completed.

4.5.1 The person in charge of sample custody will time, date, and sign over relinquishment of custody on the COC. When a common carrier is to be used for sample shipment, also record the air/waybill number (tracking number) and the name of the carrier on the COC record. Place the original copy of the COC record in a sealed, clear plastic envelop or bag and tape the COC record envelope to the inside lid of the shipping container. Retain a copy of the COC record for tracking purposes.

4.5.2 Using nylon reinforced strapping tape or mailing tape, seal the shipping container.

4.5.3 Place custody tape over opposite ends of the lid.

4.5.4 Mark the container "THIS END UP," or apply arrow labels that indicate the proper position to be maintained during shipping.

4.5.5 Apply a label stating the name and address of the shipper and the receiving laboratory on the outside of the cooler.

4.5.6 Turn the sample over to the courier or carrier for delivery to the laboratory. All samples should be shipped by the fastest available method to the laboratory as soon as possible after sample collection.

NOTE: The courier or carrier is not responsible for sample custody and is not required to sign the COC.

4.5.7 Contact the appropriate laboratory personnel to advise them of the sample shipment.

4.5.8 Review the COC and sample collection forms for completeness and turn them over to site or project management.

5.0 Records

5.1 Records generated as a result of implementation of this procedure will be controlled and maintained in the project record files.

LOGGING OF SOILS - VISUAL UNIFIED SOIL CLASSIFICATION (USCS)

STANDARD OPERATING PROCEDURE

1.0 Purpose

This procedure describes basic methods for logging soil using the USCS visual method. Use of visual examination and simple manual tests associated with the USCS procedure gives standardized criteria and processes for describing and identifying soils. Logging soil assures that data, information, and descriptions generated from each borehole or excavation are properly collected and documented. This document describes equipment and forms required, the information necessary to complete logs, and methods for describing soil samples.

2.0 References

2.1 United States Department of the Interior, Bureau of Reclamation (USBR), 1986, Procedures for Determining Unified Soil Classification (Visual Method), USBR 5005-86.

2.2 SOP 2.0 - Sample Handling, Packaging, and Shipping (Appendix A).

3.0 Definitions

This section is designed to provide definitions to the common basic terminology utilized in soil classification. It is not intended to provide substitution of training and experience necessary to learn the multitude of definitions used in soil classification.

3.1 Gravel

Particles of rock that will pass a 3-inch sieve and be retained on a No. 4 sieve. Criteria to distinguish coarse and fine is provided in Section 5.2.1 of Reference 2.1

3.2 Sand

Particles of rock that will pass a No. 4 sieve and be retained on a No. 200 sieve. Criteria to distinguish coarse, medium, and fine is provided in Section 5.2.2 of Reference 2.1

3.3 Clay

Soil passing the No. 200 sieve that exhibits plasticity (putty-like properties) within a range of moisture contents, and which exhibits considerable dry strength when air-dry. Criteria to distinguish inorganic and organic clay is provided in Section 5.2.5 and 13.6 through 13.7.2 of Reference 2.1.

3.4 Silt

Material passing the No. 200 sieve that is non-plastic or very slightly plastic and exhibits little or no strength when air-dry. Criteria to distinguish inorganic and organic silt is provided in Sections 5.2.6, 13.7.3, and 13.7.4 of Reference 2.1.

3.5 Dry Strength

This is the resistance of a 1/4-inch air-dry ball made from the test material to crushing between the fingers. Dry strength is described with the terms *None, Low, Medium, High,* and *Very High.* These terms are explained in Table 8 and dry strength procedures are presented in Sections 13.2 of Reference 2.1.

3.6 Dilatancy

This is a measure of the ability of a 1/2- to 1-inch-long pat made from the test material to yield water when shaken horizontally. Dilatancy is described with the terms *None, Slow,* and *Rapid.* These terms are described in Table 9 and dilatancy procedures are presented in Section 13.3 of Reference 2.1.

3.7 Toughness

This is a measure of the test material's ability to be rolled into a 1/8-inch-diameter thread. Toughness is described with the terms *Low, Medium,* and *High.* These terms are described in Table 10 and toughness procedures are presented in Section 13.4 of Reference 2.1.

3.8 Plasticity

This is a description of the test sample behavior derived during the performance of the toughness test. Plasticity is described with the terms *Nonplastic, Low, Medium,* and *High.* These terms are described in Table 11 and plasticity procedures are presented in Section 13.5 of Reference 2.1.

4.0 Procedure

This section provides both the responsibilities and procedures involved with soil logging. The details within this SOP will be used in conjunction with the Data Gaps Investigation Work Plan.

4.1 Responsibilities

4.1.1 The Field Coordinator will be responsible for ensuring that all sample collection activities are conducted in accordance with this SOP and any other appropriate procedures. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

4.1.2 The Project Quality Assurance Specialist (PQAS) will be responsible for periodic review of field generated documentation associated with this SOP. The PQAS will also responsible for implementation of corrective action (i.e., retraining personnel, additional review of work plans and procedures, variances to QC sampling requirements, issuing nonconformances, etc.) if problems occur.

4.1.3 Field personnel assigned to sampling activities will be responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff will be responsible for reporting deviations from procedures to the Field Coordinator, IT Project Manager, or the PQAS.

4.2 Soil Boring Logs

The log form that will be used to record information during drilling is included in Attachment 1. The procedures, which will be followed in completing the log, are outlined below.

On the first page of the log for each boring, the following information at the top of the boring log will be filled in completely and will include:

- Project Number,
- Project Name,
- Project Location,
- Boring Number,
- Engineer/Geologist Identity, and
- Drilling Methods.

On the first page of the log for each boring, the following information at the bottom of the boring log will be filled in completely and will include:

- Drilling Contractor Identity,
- Driller's Name,
- Drilling Equipment, and
- Rig Number, if there is more than one at the site.

The following information will be recorded in the Field Activity Daily Log (Attachment 2):

- Complete and accurate location sketch with dimensions to landmarks. Important features such as road intersections, corners of large buildings, or other man-made structures are best used. A north arrow will be included.

Samples collected for purposes other than soil classification are subject to handling, packaging, and shipping procedures described in Reference 2.2.

Upon completion of each boring, the log will contain the following information:

- Boring Completed at (Depth) Feet on (Date);

- Hole Backfilled to Ground Surface on (Date);
- The boring size and depth will be recorded; and
- All depth numbers will be recorded in decimals.

4.3 Borehole Logging Procedures

The left side of the log form will be filled out accurately for each soil sample and sampling attempt. Boreholes that are logged entirely from cuttings and are not sampled must be indicated as such. The following information will be included:

- Depth - The sampling attempts will be marked in the "depth in feet" column. The sample depth is always measured to the top of the sample.
- Sample Type & No. - The abbreviations for sampler types are TW for thin-wall, P for piston, ST for Shelby Tube, and SS for standard split spoon. These abbreviations, or notations as to other sampler types, will be used in the "sampler type" column. Record the sample number in this column. A sample attempt where no sample is recovered will not be numbered, but the fact that a sampling attempt was made must be noted.
- Recovery - The distance the corer is driven and the length of recovered material for each sample attempt.

The log will contain a detailed description of the soil strata encountered and all pertinent information regarding drilling operations and estimated soil and ground water properties.

- Soil will be classified according to the Unified Soil Classification System (USCS) (Reference 2.1). The textural name for the soil will be written in the appropriate column using the USCS symbol.
- Abrupt soil changes will be marked by a solid horizontal line and the appropriate depth in the USCS symbol column. Gradational soil changes will be marked by a dashed line. Diagonal lines should not be used. (Field personnel are best qualified to estimate the depth of changes. This task will not be delegated to office personnel, who have not observed the drilling operation.)
- Abbreviations will be used on the logs to save space for editing purposes.

Comments on the field log are extremely important. Some important aspects of the drilling operation that will be recorded follow:

- The organic content of the soil and the depth of topsoil and roots;
- Any sudden change in the speed, sound, or penetration rate of the drill rig;
- If sampling is not continuous, drill cuttings will be used to complete the log; and
- Any sample that is suspect of being disturbed, contaminated, or chemically or physically altered during the drilling process.

4.4 Excavation Trench Logs

The excavation trench logs will be recorded in the Field Activity Daily Log (Attachment 2). This requires the Field Coordinator/Field Geologist to make an illustration of the trench excavation.

On the first page for each excavated trench, the following information must be recorded:

- Project Number,
- Project Name,
- Project Location,
- Trench Number or Description, and
- Field Coordinator/Geologist Identity.

The following information will be recorded in the Field Activity Daily Log:

- Complete and accurate location sketch with dimensions to landmarks. Important features such as road intersections, corners of large buildings, or other man-made structures are best used. A north arrow will be included.

Samples collected for purposes other than soil classification are subject to handling, packaging, and shipping procedures as described in Reference 2.2.

Upon completion of each excavation, a standard completion note will be placed at the bottom of the last page of the trench log. The note will include:

- Excavation Completed at (Depth) Feet on (Date);
- Borehole Backfilled to Ground Surface on (Date); and
- All depth numbers will be recorded in decimals.

4.5 Excavation Logging Procedures

On the Field Activity Daily Log in which the excavation trench log is recorded, the following information will be included if samples are to be collected:

- The sampler type. The abbreviations for sampler types are TW for thin-wall, P for piston, ST for Shelby Tube, and SS for standard split spoon. These abbreviations, or notations as to other sampler types, will be used in the "sampler type" column.
- Origin of sample. Specify if it is collected directly from the trench wall or from an excavator bucket or shovel.
- The depth and location from which the sample originated. The sample depth is always measured to the top of the sample. A sample attempt where no sample is recovered will not be numbered, but the fact that a sampling attempt was made must be noted.
- The sample number.

The log will contain a detailed description of the soil strata encountered and all pertinent information regarding trenching operations and estimated soil and ground water properties.

- Soil will be classified according to the Unified Soil Classification System (USCS) (Reference 2.1). The textural name for the soil will be written on the excavation illustration at the appropriate depth interval.
- Abrupt soil changes will be marked by a solid horizontal line and the appropriate depth in the USCS symbol column. Gradational soil changes will be marked by a dashed line. Diagonal lines should not be used. (Field personnel are best qualified to estimate the depth of changes. This task will not be delegated to office personnel, who have not observed the excavation operation.)
- Abbreviations will be used on the logs to save space for editing purposes.

Comments on the field log are extremely important. Some important aspects of the excavation operation that will be recorded follow:

- The organic content of the soil and the depth of topsoil and roots;
- Any sudden change in the speed, sound, or penetration rate of the excavation; and
- Any sample that is suspect of being disturbed, contaminated, or chemically or physically altered during the excavation process.

5.0 Records

5.1 Records generated as a result of this SOP will be controlled and maintained in the project record files.

6.0 Attachment

6.1 Attachment 1, Visual Classification of Soils

6.2 Attachment 2, Field Activity Daily Log

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER:	PROJECT NAME:	
BORING NUMBER:	COORDINATES:	DATE:
ELEVATION:	GWL: Depth Date/Time	DATE STARTED:
ENGINEER/GEOLOGIST:	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS:		PAGE OF

DEPTH ( )	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS

NOTES:

Drilling Contractor _____

Drilling Equipment _____

Driller: _____

DAILY LOG			
DATE			
NO.			
SHEET		OF	

FIELD ACTIVITY DAILY LOG

PROJECT NAME	PROJECT NO.
FIELD ACTIVITY SUBJECT:	
DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:	
VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS.
WEATHER CONDITIONS:	IMPORTANT TELEPHONE CALLS:
IT PERSONNEL ON SITE:	
SIGNATURE	

SURFACE/SUBSURFACE SAMPLING

STANDARD OPERATING PROCEDURE

1.0 Purpose

This Procedure establishes guidelines and procedures for use by field personnel in the collection and documentation of surface and subsurface samples for physical and chemical analysis. Proper collection procedures are necessary to assure the quality and integrity of all surface and shallow subsurface soil samples. Additional specific procedures and requirements will be provided in the Work Plan.

2.0 References

2.1 EPA, September 1987, Compendium of Superfund Field Operations Methods, EPA 540/P-87/001a, OSWER 9355.0-14.

2.2 EPA, August 1988, EPA Guidelines for Conducting Remedial Investigation and Feasibility Studies under CERCLA, Interim Final OSWER Directive 9355.3-01.

2.3 SOP 2.0 - Sample Handling, Packaging and Shipping (Appendix A)

2.4 SOP 5.0 - Chain of Custody (Appendix A).4 SOP 5.0 - Chain of Custody (Appendix A)

3.0 Definitions

3.1 Surface Soil Sample

Soil collected between a depth of zero and six inches.

3.2 Subsurface Soil Sample

Soil collected at any depth interval greater than 6 inches.

3.3 Disturbed Soil Sample

A soil sample in which the in situ physical structure and fabric has been disturbed as the direct result of sample collection.

3.4 Undisturbed Soil Sample

A soil sample in which the in situ physical structure and fabric has not been disturbed as the result of sample collection.

3.5 Grab Samples

Representative disturbed soil sample that is collected by using such devices as a shovel, stainless steel spoon, etc.

3.6 Composite Samples

A soil sample comprised of material from more than one source or location.

4.0 Procedure

This section contains both the responsibilities and procedures involved with surface and subsurface soil sampling. Proper sampling procedures are necessary to insure the quality and integrity of the samples. The details within this SOP will be used in conjunction with the Work Plan. The Work Plan will generally provide the following information:

- Sample collection objectives;
- Locations and depths of samples to be collected;
- Numbers and volumes of samples to be collected;
- Types of analyses to be conducted for the samples;
- Specific quality control (QC) procedures and sampling required; and
- Any additional shallow subsurface sampling requirements or procedures beyond those covered in this SOP, as necessary.

At a minimum, the procedures outlined below will be followed.

4.1 Responsibilities

4.1.1 The Field Coordinator will be responsible for ensuring that all sample collection activities are conducted in accordance with this SOP and any other appropriate procedures. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

4.1.2 The Project Quality Assurance Specialist (PQAS) will be responsible for periodic review of field generated documentation associated with this SOP. The PQAS will also responsible for implementation of corrective action (i.e., retraining personnel, additional review of work plans and procedures, variances to QC sampling requirements, issuing nonconformances, etc.) if problems occur.

4.1.3 Field personnel assigned to sampling activities will be responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff will be responsible for reporting deviations from procedures to the Field Coordinator, IT Project Manager, or the PQAS.

4.2 Surface Sampling Equipment

A number of devices are available for the collection of surface soil samples. These include, but are not limited to: core samplers, hand augers, spoons, scoops, trowels, shovels, triers, etc. These devices are constructed of a number of materials including, but not limited to, stainless steel, brass, glass, teflon, etc.

The sampling and analytical requirements, as well as site characteristics, must be taken into account when determining the proper surface soil sampling equipment to use.

At present, the method commonly used for the collection of surface and subsurface samples, both disturbed and undisturbed, is a core sampler. The core sampler is usually a hollow, stainless steel cylinder, tapered at the leading end. A sample sleeve (brass, stainless steel, lexan, etc.) is inserted into the trailing end. The trailing end is then connected to a piston-type drive hammer. The core is driven into the soil by the hammer so that a relatively undisturbed sample is collected in the sleeve. The sample is then handled and shipped in the sample sleeve.

When a core sample is not feasible or planned, a sample can be collected by using such devices as a shovel, hand auger, trowel, or stainless steel spoon, etc. The soil is transferred from the collection device into decontaminated sample containers (commonly glass jars). The Work Plan will specify the type of sampling equipment to be used. The sample containers to be used will also be specified in the Work Plan.

4.3 Subsurface Sample Collection

4.3.1 The common method to collect subsurface samples is to use a hand auger to bore to the desired sampling depth and then retrieve the sample with a core sampler. The hand auger might also be used to recover the sample for direct transfer into glass jars. The exact methodology to be used will be specified in the Work Plan.

For subsurface samples of less than 18 inches in depth, successive drives of the core sampler may potentially be used to recover shallow subsurface soil samples. In all methods cited above, borehole stability should be maintained to prevent the recovery of slough in the samples. If sloughing cannot be controlled, then another sampling methodology may have to be considered.

4.3.2 Prior to sampling and between sampling locations, decontaminate the sample equipment according to procedures outlined in the Work Plan.

4.3.3 Ensure that all subsurface soil sampling locations have been appropriately cleared of all underground utilities and buried objects per the Work Plan. Review all forms and diagrams documenting the location of the cleared sampling locations, as well as that of any underground utilities or lines, or other buried objects.

4.3.4 As required, calibrate any health and safety monitoring equipment according to the instrument manufacturer's specifications. Calibration results will be recorded on the appropriate form(s), as specified in the Work Plan. Instruments that cannot be calibrated according to the manufacturer's specifications will be removed from service and tagged.

4.3.5 Don appropriate personal protection equipment as specified in the Work Plan.

4.3.6 If using the coring device, place the sleeve into the device and drive the assembly into the soil using the drive hammer. Drive the device into the soil until the trailing end of the sleeve is at the soil surface.

4.3.7 Retrieve the device; check to see that soil recovery is adequate in the sample sleeve. If there is sufficient recovery, mark or note the leading end of the sample sleeve.

4.3.8 If using a different sample collection device (other than the coring device), use the other device to scoop or collect soil and directly transfer the soil into the sample container (e.g., glass jar, brass sample sleeve, etc.). Fill the sample container such that little to no head-space exists.

4.3.9 If using sample sleeves, place teflon tape over each end of the sleeve and seal each end with plastic end caps. With a permanent marker, write a "T" for top on the trailing end and a "B" for bottom on the leading end. Place custody tape over each end cap so that any attempt to remove the cap will cause the tape to be broken.

If using glass jars, cap or seal the jars appropriately and place custody tape over the cap so that any attempt to remove the cap will cause the tape to be broken.

4.3.10 Appropriately label and number the sample containers per the Work Plan. The label will be filled out with waterproof ink and will contain, at a minimum, the following information:

- Project number
- Sample number;
- Sample location;
- Sample depth;
- Sample type;
- Date and time of collection;
- Parameters for analysis; and
- Sampler's initials.

4.3.11 Document the sampling event and any pertinent field observations, conditions or problems in the Field Activity Daily Log. Record sample collection on the Sample Collection Log (Attachment 1). Any encountered problems or unusual conditions should also be immediately brought to the attention of the Field Coordinator.

4.3.12 Appropriately preserve, handle, package, and ship the samples per the Work Plan. The samples shall also be maintained under custody per SOP 5.0, "Chain of Custody" (Reference 2.4).

4.4 Equipment Blanks

Equipment blanks will be collected during soil sampling activities to provide an additional check on possible sources of contamination related to field sampling instruments. Laboratory-supplied distilled or deionized water is passed through or over clean sampling equipment and collected directly into empty sample containers for analysis. Equipment blanks will be handled and transported in the same manner as the samples acquired that day. Equipment blanks will be analyzed for a specific parameter list according to water analytical methods. Equipment blanks will be collected for each investigation activity in each investigation area. For example, three equipment blanks would be collected in an investigation area during sampling activities that include a backhoe exploration, stage 1 soil boring, and stage 2 soil boring. The equipment blanks will be tested for the analytes specified in the Work Plan.

5.0 Records

5.1 Records generated as a result of this SOP will be controlled and maintained in the project record files.

6.0 Attachments

6.1 Attachment 1, Sample Collection Log

SAMPLE COLLECTION LOG

DATE	
TIME	
PAGE	OF
PAGE	
PROJECT NO.	

PROJECT NAME _____

SAMPLE NO. _____

SAMPLE LOCATION _____

SAMPLE TYPE _____

COMPOSITE _____ YES _____ NO

COMPOSITE TYPE _____

DEPTH OF SAMPLE _____

WEATHER _____

CONTAINERS USED	AMOUNT COLLECTED

COMMENTS:

PREPARED BY: _____

BOREHOLE SAMPLING

STANDARD OPERATING PROCEDURE

1.0 Purpose

This Procedure establishes guidelines and procedures for use by field personnel in the collection and documentation of borehole subsurface samples for physical and chemical analysis. Proper collection procedures are necessary to assure the quality and integrity of all subsurface soil samples. Additional specific procedures and requirements will be provided in the Work Plan.

2.0 References

2.1 EPA, September 1987, Compendium of Superfund Field Operations Methods, EPA 540/P-87/001a, OSWER 9355.0-14.

2.2 EPA, August 1988, EPA Guidelines for Conducting Remedial Investigation and Feasibility Studies under CERCLA, Interim Final OSWER Directive 9355.3-01.

2.3 SOP 2.0 - Sample Handling, Packaging and Shipping (Appendix A)

2.4 SOP 6.0 - Chain of Custody (Appendix A)

3.0 Definitions

3.1 Subsurface Soil Sample

Soil collected at any depth interval greater than 6 inches.

3.2 Disturbed Soil Sample

A soil sample in which the in situ physical structure and fabric has been disturbed as the direct result of sample collection.

3.3 Undisturbed Soil Sample

A soil sample in which the in situ physical structure and fabric has not been disturbed as the result of sample collection.

3.4 Grab Samples

Representative disturbed soil sample that is collected by using such devices as a shovel, stainless steel spoon, etc.

3.5 Composite Samples

A soil sample comprised of material from more than one source or location.

4.0 Procedures

This section contains both the responsibilities and procedures involved with borehole sampling. Proper sampling procedures are necessary to insure the quality and integrity of the samples. The details within this SOP will be used in conjunction with the Work Plan. The Work Plan will provide the following information:

- Sample collection objectives
- Locations and depths of samples to be collected
- Numbers and volumes of samples to be collected
- Types of analyses to be conducted for the samples
- Specific quality control (QC) procedures and sampling required
- Any additional shallow subsurface sampling requirements or procedures beyond those covered in this SOP, as necessary.

At a minimum, the procedures outlined below will be followed.

4.1 Responsibilities

4.1.1 The Field Coordinator will be responsible for ensuring that all sample collection activities are conducted in accordance with this SOP and any other appropriate procedures. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

4.1.2 The Project Quality Assurance Specialist (PQAS) will be responsible for periodic review of field generated documentation associated with this SOP. The PQAS will also responsible for implementation of corrective action (i.e., retraining personnel, additional review of work plans and procedures, variances to QC sampling requirements, issuing nonconformances, etc.) if problems occur.

4.1.3 Field personnel assigned to sampling activities will be responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff will be responsible for reporting deviations from procedures to the Field Coordinator, Project Manager, or the PQAS.

4.2 Sample Collection

Due to the wide variety of sampling conditions, types of samples, and purpose for collecting soil samples, several possible methods may be used to collect the soil sample. Specific procedures for various methods are described below. There are numerous procedures that can be followed for most soil sampling methods, and exact methodologies to be used will be specified in the Work Plan. The procedures include:

- Prepare sample collection logs and record relevant data on Field Activity Daily Logs prior to sampling
- Decontaminate sampling equipment as specified in the Work Plan or to EPA

protocol, if samples destined for chemical analysis are to be collected

- Clear surface vegetation, rocks, and other material not designated for sampling from the sampling point
- Review all forms and diagrams documenting the location of the cleared sampling locations, as well as that of any underground utilities or lines or other buried objects
- As required, calibrate any health and safety monitoring equipment according to the instrument manufacturer's specifications. Calibration results will be recorded on the appropriate forms, as specified on the Work Plan. Instruments that cannot be calibrated according to the manufacturer's specifications will be removed from service and tagged "non-operational."
- Use drilling or penetration methods if necessary to reach the desired sampling depth
- Collect samples using appropriate sampling method described in Section 4.3
- Lithologically log the sample and boring (SOP 3.0, Logging of Soil - Visual USCS)
- Fill necessary sample containers
- Affix sample container with appropriate labels, being sure to provide required information
- Place the properly labeled sample container in an appropriate carrying container at required temperature
- Either discard or decontaminate all items which contact the sample such as trowel, split-spoon sampler, and gloves before proceeding to the next sampling location
- Add information pertaining to the sample to the COC, Field Activity Daily Log, and Sample Collection Logs
- Package and ship samples as described in SOP 2.0 (Reference 2.3).

4.3 Soil Sampling

Several methods may be used to collect subsurface soil samples. Some of the procedures for the more common sampling methods are described below.

4.3.1 Set-up Procedures

Several drilling methods may be used to reach desired depths for soil sampling. Samples may be collected at any interval. In addition to drilling methods, subsurface depths can be reached by a power auger, a hand bucket auger, or a backhoe.

When the desired depth has been reached, the borehole will be prepared for sampling. To prepare for sampling, the borehole should be cleaned out to the desired sampling depth using equipment that will ensure that the material to be sampled is not disturbed by the operation. When drilling in saturated sands and silts, the bit should be withdrawn slowly, to prevent loosening of the

soil around the hole. When using dual tube or casing hammer methods, care will be taken not to drive the casing below the desired sampling depth before the sample is collected.

When the desired sampling depth has been reached and the borehole has been prepared, there are several subsurface methods that will commonly be used to collect samples.

Samples will be collected with either a continuous coring or shelby tube sampler. The determination of which sampling procedure to use is a function of the specific activity at hand. Sonic drilling, for example, will predominantly utilize continuous coring for sample collection. A description of each of the procedures follows:

4.3.2 Continuous Core Sampling System Methods

Continuous core sampling system methods may be specified where continuous soil cores are to be recovered by sonic drilling. The continuous sampling system utilizes a barrel, which recovers a soil core from the interval the barrel is advanced through. The barrel is recovered after the total depth of the borehole is attained.

Representative samples of the soil cores can be placed in glass jars or brass sleeves for future analysis. The entire length of the soil cores will be placed in core boxes, should it be necessary to retain them. Care will be taken to mark intervals of core loss with styrofoam blocks. All soil cores will be logged according to procedures outlined in SOP 3.0 (Logging of Soil - Visual USCS).

If the sample is transferred from the sonic corer into jars or sleeves, fill the sample container such that little or no head-space exists. If using sample sleeves, place teflon tape over each end of the sleeve and seal with plastic caps. Place custody tape over each end cap so that any attempt to remove the cap will cause the tape to be broken. If using glass jars, cap or seal the jars and place custody tape over the cap so that any attempt to remove the cap will break the tape.

4.3.3 Shelby Tube Sampling

Shelby tube samples will be collected from excavator or backhoe buckets of removed soil during trench excavations. Procedures for collecting a Shelby tube sample are listed below:

- Determine location from trench or excavation to collect sample from
- Bring soil from desired location to surface with excavator or backhoe
- Clear the sample collection location using a spade or hand trowel by digging into the soil 6 to 8 inches
- Place the shelby tube firmly into the cleared sample collection location and drive it deeply enough into the excavated soil to fill it.

4.4 Equipment Blanks

Equipment blanks will be collected during soil sampling activities to provide an additional check on possible sources of contamination related to field sampling instruments. Laboratory-supplied distilled or deionized water is passed through or over clean sampling equipment and collected directly into empty sample containers for analysis. Equipment blanks will be handled and

transported in the same manner as the samples acquired that day. Equipment blanks will be analyzed for a specific parameter list according to water analytical methods. Equipment blanks will be collected as specified in the Work Plan. The equipment blanks will be tested for the analytes specified in the Work Plan.

4.5 Sample Documentation

4.5.1 Appropriately label and number the sample containers per the Work Plan. The label will be filled out with waterproof ink and will contain, at a minimum, the following information:

- Project number
- Sample number
- Sample location
- Sample depth
- Sample type
- Date and time of collection
- Parameters for analysis
- Sampler's initials.

4.5.2 Document the sampling event and any pertinent field observations, conditions or problems in the Field Activity Daily Log. Record sample collection on the Sample Collection Log (Attachment 1). Any encountered problems or unusual conditions should also be immediately brought to the attention of the Field Coordinator.

4.5.3 Appropriately preserve, handle, package, and ship the samples per SOP 2.0 (Reference 2.3). The samples shall also be maintained under custody per SOP 6.0, "Chain of Custody" (Reference 2.4).

5.0 Records

5.1 Records generated as a result of this SOP will be controlled and maintained in the project record files.

6.0 Attachment

6.1 Attachment 1, Sample Collection Log

CHAIN OF CUSTODY

STANDARD OPERATING PROCEDURE

1.0 Purpose

This Procedure establishes the method and responsibilities associated with the maintenance and custody of samples, which are to be used to provide data relative to making project, related decisions. It outlines the general procedures for maintaining and documenting sample chain of custody from the time of sample collection through sample disposition.

2.0 References

2.1 Draft LEHR Quality Assurance Project Plan, WA, 1997.

3.0 Definitions

3.1 Chain of Custody (COC)

The COC is the written record that traces the sample possession from the time each sample is collected until its final disposition, sometimes called the "cradle to grave" record. Chain of Custody is maintained by compliance with one of the following criteria:

- The sample is in the individual's physical possession;
- The sample is maintained in the individual's physical view after being in his/her possession;
- The sample is transferred to a designated secure area restricted to authorized personnel; and
- The sample is sealed and maintained under lock and key to prevent tampering, after having been in physical possession.

3.2 Waybill

A document that contains a list of the goods and shipping instructions relative to a shipment.

3.3 Common Carrier

For the purpose of this procedure, the common carrier is any commercial carrier utilized for the transportation of the sample(s) from the field to the laboratory.

4.0 Procedure

4.1 Responsibilities

4.1.1 Project Manager - The Project Manager is responsible for assuring proper COC is initiated at the time the sample(s) are collected and maintained throughout the handling and subsequent transportation of the sample(s) to the designated laboratory. Additionally, he/she is the project authority for determining the disposition and fate of sample(s) which have identified deficiencies (e.g., missed holding times, elevated temperature at receipt, etc.).

4.1.2 Sample Team Member(s) - Sample team members are responsible for properly documenting and maintaining the COC from the time of sample collection until the sample is delivered to the lab.

4.1.3 Laboratory - Laboratory personnel are responsible for receipt and entry of samples into the laboratory, which have been submitted under a COC Record. Additionally, samples received will be entered into the laboratory COC procedures by properly documenting and maintaining COC from the moment that they take custody of the sample at the laboratory until the sample is disposed of or returned to the client.

4.2 General

4.2.1 An overriding consideration for data resulting from laboratory analyses is the ability to demonstrate that the samples were obtained from the locations stated and that they reached the laboratory without alteration. Evidence of collection, shipment, laboratory receipt, and laboratory custody until disposal must be documented to accomplish this. Documentation will be accomplished through a COC Record that lists each sample and the individuals performing the sample collection, shipment, and receipt.

4.2.2 The IT COC Record is a preprinted form with a unique six-digit control number in the upper right-hand corner. The white copy will accompany the samples while the yellow field copy will be retained in the project file.

4.3 Field Sample Custody

4.3.1 Sampling personnel upon collection of samples to be analyzed for project information will properly complete a COC Record form (Attachment 1). The COC Record form will be the controlling document to assure that sample maintenance and custody are maintained thereby assuring the sample(s) are representative of the environment from which they were collected. At a minimum, the following information will be recorded on the COC Record form:

- The unique identification number assigned to each sample.
- A brief description of the sampling location and a physical description of the sample type.
- The date and time of the sample collection.
- Container type (e.g., glass, poly, brass sleeve, etc.).

- Sample volume and number of containers (e.g., 2 x 40 ml, 3 x 1 liter).
- Sample preservation (e.g., HNO_3, H_2SO_4, 4^oC).
- Requested analyses.
- Special instructions to the laboratory including handling requirements, quality assurance/quality control, health and safety, and sample disposition.
- The project name and number.
- The date the analytical report is due.
- The names of all sampling personnel.
- The name and phone number of the project contact.
- The name and phone number of the laboratory contact.
- The name of the courier and the waybill number (if applicable).
- A unique document reference number.

4.3.2 The COC Record form will be initiated in the field by the person collecting the sample and signed by each individual who has the samples in their possession. Each time that sample custody is transferred, the former custodian must sign over the COC as Relinquished By, and the new custodian must sign on to the COC as Received By. Each signature must be accompanied by the date, time, and the name of their project or company affiliation.

4.3.3 Transferring of COC from sampling personnel to the analytical laboratory will be performed in accordance with the requirements stated below.

4.3.3.1 If the sampling personnel deliver the samples to the laboratory, transfer of COC occurs as follows:

- The sample collector delivers the samples to the laboratory and relinquishes the sample directly to a laboratory representative.
- The collector signs the COC listing his/her name, affiliation, the date, and time. Any person involved in the collection of the sample may act as the sample custodian.
- The laboratory representative must receive the samples by signing his/her name, affiliation, the date, and time on the COC. The laboratory representative may decline to take receipt of the samples if the COC is not properly completed or if the samples are not properly packaged. All designated laboratory personnel may act as the sample custodian.
- One copy of the COC is given to the sample collector to be returned to the project files and one copy is maintained with the samples at the laboratory.

4.3.3.2 If the sampling personnel transfer sample(s) to the laboratory utilizing a common carrier, sampling personnel will retain COC responsibility and the common carrier is not responsible for maintaining sample custody. The sample collectors are responsible for packaging the samples in a manner that meets the COC definition criteria, that is, the samples are sealed to prevent tampering.

When transferring samples to the courier for transport, COC procedures are maintained as follows:

- The sample collector lists the courier affiliation and waybill number on the COC.
- The sample collector relinquishes custody by signing his name, affiliation, date, and time. The collector keeps a copy of the relinquished COC for the project file.
- The relinquished original COC is sealed in a watertight plastic bag and taped to the inside of the lid of the container used for transportation.
- The transportation container is sealed to prevent tampering and given to the courier for delivery to the laboratory.
- The sample collector obtains a copy of the waybill from the courier for the project file.
- The laboratory representative must receive the samples by signing his/her name, affiliation, the date, and time on the COC. This copy is maintained with the samples at the laboratory.
- laboratory representative obtains a copy of the waybill from the courier for the project file.

4.4 Analytical Laboratory Custody

4.4.1 Upon receipt at the analytical laboratory, the field generated COC Record form will be signed, dated, time marked, temperature marked, and laboratory identification will be provided in the appropriate spaces.

4.4.2 Laboratory receipt personnel will enter the samples into the laboratory by implementing the sample custody procedures addressed within their approved QA Program.

4.4.3 After completion of analytical testing, sample remnants not consumed during testing may be kept for six months beyond the completion of analysis, unless otherwise specified by Project Management. Once this time period has elapsed, the samples will be disposed of and the disposal record number will be recorded on the laboratory record copy of the COC.

5.0 Records

5.1 Records generated as a result of this SOP will be controlled and maintained in the project files.

6.0 Attachment

6.1 Attachment 1, Chain of Custody Record Form

CHAIN OF CUSTODY RECORD FORM

*See back of form for special instructions

WHITE - to accompany samples · YELLOW - field copy

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD*

Reference Document No. 371464
Page 1 of ___

Project Name/No. [1]
Sample Team Members [2]
Profit Center No. [3]
Project Manager [4]
Purchase Order No. [6]
Required Report Date [11]

Samples Shipment Date [7]
Lab Destination [8]
Lab Contact [9]
Project Contact/Phone [12]
Carrier/Waybill No. [13]

Bill to [5]

Report to: [10]

ONE CONTAINER PER LINE

Sample Number [14]	Sample Description/Type [15]	Date/Time Collected [16]	Container Type [17]	Sample Volume [18]	Preservative [19]	Requested Testing Program [20]	Condition on Receipt [21]	Disposal Record No. [22]

Special Instructions: [23]

Possible Hazard Identification: [24]
Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐

Sample Disposal: [25]
Return to Client ☐ Disposal by Lab ☐ Archive ☐ (mos.)

Turnaround Time Required: [26]
Normal ☐ Rush ☐

QC Level: [27]
I ☐ II ☐ III ☐ Project Specific (specify).

1. Relinquished by [28] (Signature/Affiliation)	Date: Time:	1. Received by [29] (Signature/Affiliation)	Date: Time:
2. Relinquished by (Signature/Affiliation)	Date: Time:	2. Received by (Signature/Affiliation)	Date: Time:
3. Relinquished by (Signature/Affiliation)	Date: Time:	3. Received by (Signature/Affiliation)	Date: Time:

Comments: [31]