Appendix A

Soil Management Plan

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Soil Management Plan

November 2010

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Abbreviations

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CRWQCB	California Regional Water Quality Control Board
DOE	U.S. Department of Energy
DSS	Domestic Septic System
DTSC	California Department of Toxic Substances Control
EDPs	Eastern Dog Pens
EH&S	Environmental Health and Safety
EPA	U.S. Environmental Protection Agency
ID	identification
LEHR	Laboratory for Energy-Related Health Research
LTS&M	long-term surveillance and maintenance
MDL	method detection limit
MOA	Memorandum of Agreement
PCBs	polychlorinated biphenyls
Ra/Sr	Radium/Strontium
RD/RAWP	Remedial Design/Remedial Action Work Plan
ROD	Record of Decision
SMP	Soil Management Plan
SWT	Southwest Trenches
UC	University of California
UC Davis	University of California, Davis
WDPs	Western Dog Pens
Weiss	Weiss Associates

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1.0 Introduction

This Soil Management Plan (SMP) provides information on, and direction for managing, minor residual contamination in soil that may be disturbed during work at the U.S. Department of Energy (DOE) areas of the former Laboratory for Energy-Related Health Research (LEHR) Federal Facility. This plan is a component of the Remedial Design/Remedial Action Work Plan (RD/RAWP), which provides requirements for implementing land-use restrictions per the Record of Decision (ROD) for the DOE Areas at LEHR (DOE 2009a) issued under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. Certain activities that only disturb shallow soil (<1 foot deep) and generate *de minimis* amounts of soil (5 cubic yards or less) and that do not require off-site disposal are not subject to the requirements of this plan.

1.1 Background

From 1958 to 1988, DOE operated the LEHR Federal Facility at the south campus of the University of California, Davis (UC Davis) (Figure A–1 and Figure A–2). Research at LEHR focused on the long-term health effects of low-level radiation on laboratory animals. The disposal of chemical and radioactive laboratory and campus waste contaminated soil and groundwater at LEHR. In May 1994, the U.S. Environmental Protection Agency (EPA) added the site to the National Priorities List. The responsibilities for the cleanup of the site were divided between DOE and UC Davis: DOE is responsible for remediating soil contamination in the DOE areas shown in Figure A–2 and any associated groundwater contamination, and UC Davis is responsible for cleaning up six landfill units and any associated groundwater contamination. UC Davis is developing remedial alternatives for their areas. If land-use restrictions, including soil management requirements, are adopted for UC Davis areas, this SMP may be amended to incorporate them.

DOE has successfully completed decontamination, decommissioning, and removal actions at the DOE areas of the LEHR Federal Facility, and has thereby significantly reduced impacts of the chemical and radioactive contamination on human health and the environment to levels acceptable under CERCLA for current and anticipated land uses. Residual contaminants remain at the site at concentrations that prevent its unrestricted use (residential use) in the Domestic Septic System (DSS) 4 area, or that could contaminate groundwater above acceptable background levels.

1.1.1 Completed Removal Actions

In 1995, DOE demolished the Imhoff Wastewater Treatment Facility (Figure A–2) as a voluntary removal action, and by 1997, DOE had completed the decontamination and decommissioning of the building (62 FR 51844–51845). DOE was responsible for the remediation of the Radium/Strontium (Ra/Sr) Treatment Systems; a waste burial area known as the DOE Disposal Box; on-site domestic septic tanks, associated leach fields, and dry wells; DOE disposal trenches; and the former Dog Pens (EPA 1999). By 2009, DOE had completed removal actions that addressed the principal threats at the DOE Disposal Box area, the Southwest Trenches (SWT) area, the Ra/Sr Treatment Systems area (which included DSS 2, parts of DSS 1, and parts of the DSS 5 leach field [including Dry Wells A–E]), the Western Dog Pens (WDPs), and the DSS 3 and 6 areas (Figure A–2).

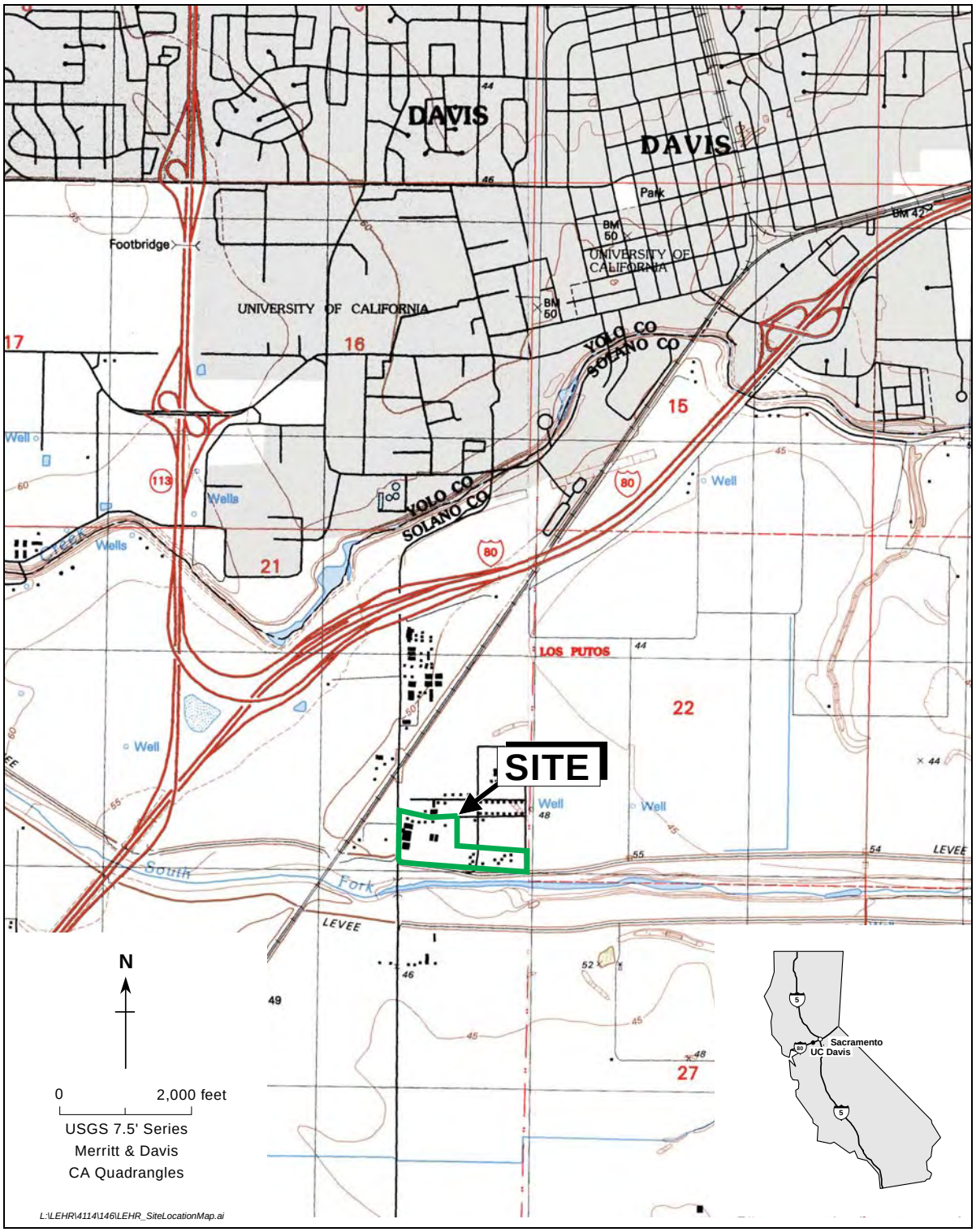


Figure A–1. Location of the LEHR Site, UC Davis, Solano County, California

Figure A–2. LEHR Site Features

1.1.2 Areas Requiring No Action or No Further Action

DOE released all of the LEHR buildings to UC Davis for unrestricted use and accelerated site cleanup by completing several removal actions that addressed the principal environmental threats at the LEHR Federal Facility. Based on DOE's compliance with DOE Order 5400.5, *Radioactive Protection of the Public and the Environment*, for the release of property for unrestricted use (62 FR 51844–51845), no action or no further action is required at all LEHR buildings (including the Imhoff Wastewater Treatment Facility demolished in 1995).

In addition to no action being necessary at the LEHR buildings, based on the *Site-Wide Risk Assessment, Volume I: Human Health Risk Assessment (Part B Risk Characterization for DOE Areas)* (Weiss 2005), no further action is required at the following areas of the LEHR Federal Facility:

- DSS areas other than DSSs 3 and 4,
- The DOE Disposal Box, and
- The WDPs area (Figure A–2).

Similarly, no action is required at the Cobalt-60 Irradiation Field because the area has no identified contamination, and there is no potential for contamination based on historical use.

Figure A–2 shows all of these areas and their designations.

1.1.3 Areas Requiring Additional Action

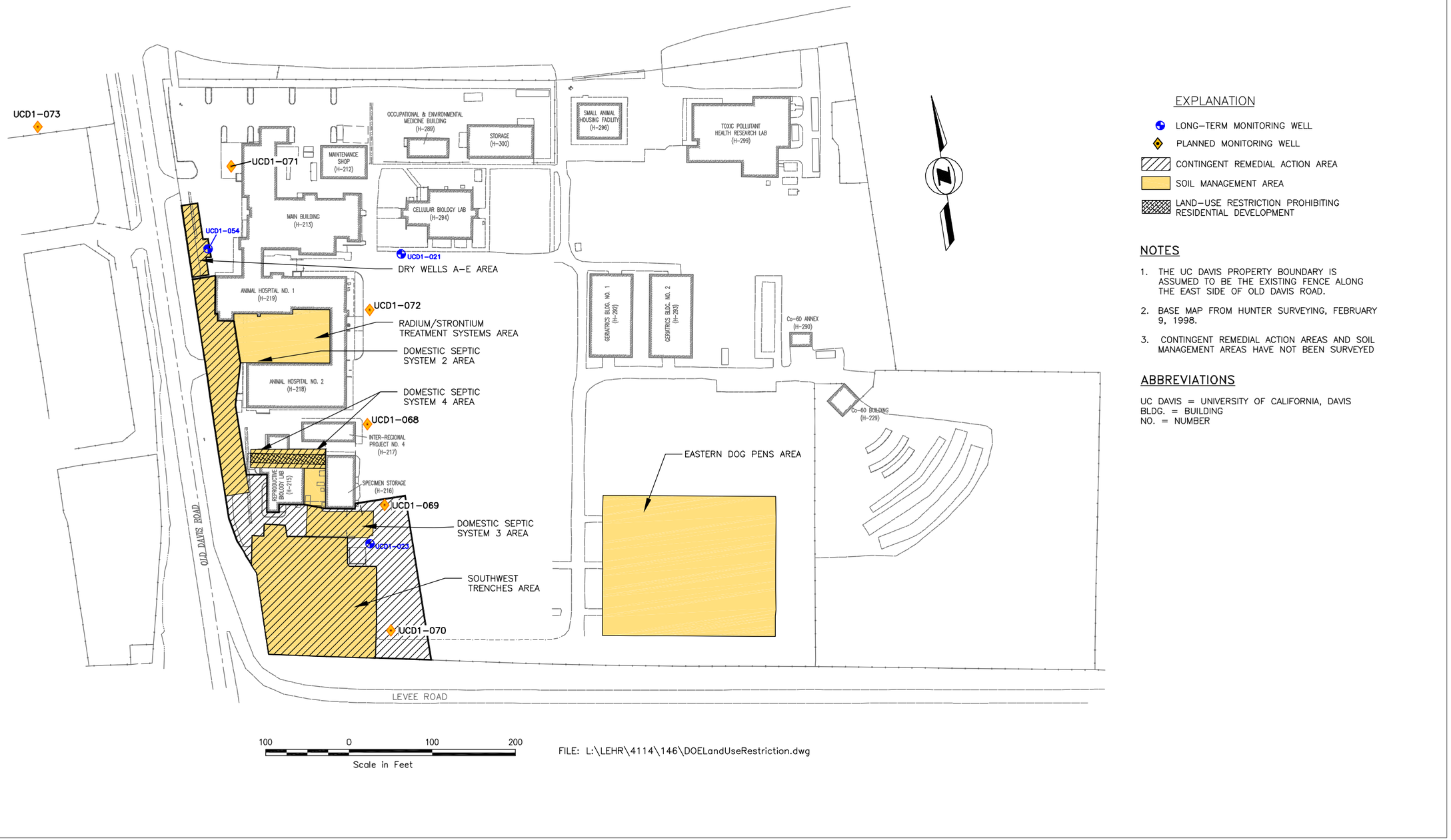
The following areas of the LEHR Federal Facility contain residual contaminants that present potential excess cancer risks above 1 in 1 million, or have the potential to impact groundwater quality:

- The Ra/Sr Treatment Systems area;
- DSS 3;
- DSS 4;
- Dry Wells A–E;
- The SWT area; and
- The Eastern Dog Pens (EDPs) area (Figure A–3).

1.1.4 Record of Decision

In 2009, DOE and EPA approved a ROD for the DOE areas at LEHR (DOE 2009a) in accordance with CERCLA. The ROD documents the selection of the following remedies for the DOE areas:

- Long-term groundwater monitoring with contingent remediation and an SMP at the Ra/Sr Treatment Systems area, DSS 3, Dry Wells A−E, and the SWT area.
- Long-term groundwater monitoring with contingent remediation, a land-use restriction prohibiting residential use, and an SMP at DSS 4.



EXPLANATION

- LONG–TERM MONITORING WELL
- PLANNED MONITORING WELL
- CONTINGENT REMEDIAL ACTION AREA
- SOIL MANAGEMENT AREA
- LAND–USE RESTRICTION PROHIBITING RESIDENTIAL DEVELOPMENT

NOTES

1. THE UC DAVIS PROPERTY BOUNDARY IS ASSUMED TO BE THE EXISTING FENCE ALONG THE EAST SIDE OF OLD DAVIS ROAD.
2. BASE MAP FROM HUNTER SURVEYING, FEBRUARY 9, 1998.
3. CONTINGENT REMEDIAL ACTION AREAS AND SOIL MANAGEMENT AREAS HAVE NOT BEEN SURVEYED

ABBREVIATIONS

UC DAVIS = UNIVERSITY OF CALIFORNIA, DAVIS
BLDG. = BUILDING
NO. = NUMBER

Figure A–3. DOE Areas at LEHR Subject to Land-Use Controls, Including Soil Management

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- The implementation of an SMP at the EDPs area.
- No further action at the DSS 1, DSS 5, DSS 6, DSS 7, WDPs, and DOE Disposal Box areas.

The land-use control components of the selected remedy are described in the RD/RAWP, and include the development and implementation of this SMP (which is an appendix to the RD/RAWP) to specify controls that would apply to activities that disturb the subsurface. The general requirements of the RD/RAWP and this SMP shall be documented in recorded land-use covenants.

1.2 Objective

The objective of this SMP is to establish policy and requirements for the management and disposal of soils generated during construction, maintenance, and other activities that might disturb contaminated soil at the DOE areas at LEHR.

1.3 Purpose

This SMP describes specific soil-handling controls required for compliance with the ROD (DOE 2009a). As stated in the ROD, the purpose of the SMP is to:

- Prevent unacceptable exposure to contaminated soil, and
- Prevent the improper disposal of contaminated soils.

1.4 Organization

This SMP contains:

- Background information about the DOE areas of the LEHR Federal Facility;
- The roles and responsibilities of DOE, UC Davis, and the regulatory agencies in implementing this SMP;
- Information on the nature and extent of soil contaminants at the DOE areas at LEHR;
- Requirements for the management of contaminated soils that might be disturbed during construction, maintenance, or other activities;
- Requirements for the disposal of waste soils generated during construction, maintenance, or other activities;
- Requirements for emergency work that might disturb contaminated soil;
- Inspection requirements; and
- Recordkeeping and reporting requirements.

1.5 Applicability

This SMP applies to soil-disturbing activities performed at the DOE areas at LEHR identified in Figure A–3 as subject to the SMP. Soil-disturbing activities include excavation, grading, trenching, utility installation or repair, and any other human activities that could potentially bring

contaminated soil to the surface. The plan applies to such work regardless of the entity performing the work.

1.5.1 Excluded Activities

This plan does not apply to DOE areas that require no action or no further action (see Section 1.1.2 above).

The plan does not apply to landscaping, fire protection, or maintenance work that meets all of the following conditions:

- Work is conducted at depths less than 1 foot below ground surface.
- Less than 5 cubic yards of soil waste is significantly displaced (e.g., stockpiled, placed in containers).
- All soil is returned to the disturbed area.

Such work may proceed without restriction.

1.6 Duration

This SMP shall remain in effect until the concentrations of contaminants in the soil are at levels that allow unrestricted use. The regulatory agencies must approve termination of the SMP.

1.7 Revisions

This SMP shall be updated during 5-year reviews or sooner, if needed. The regulatory agencies must approve all revisions to the SMP.

2.0 Roles and Responsibilities

Implementing this SMP is the responsibility of DOE. DOE has agreed with the Regents of the University of California (UC) that the Environmental Health and Safety (EH&S) Unit at the UC Davis campus (see Section 2.2.2.1) will implement the requirements of this plan, with DOE retaining ultimate accountability for compliance with the requirements of the ROD that this SMP executes.

2.1 U.S. Department of Energy

DOE is responsible for ensuring that activities at LEHR comply with the requirements of the ROD. DOE has entered into a Memorandum of Agreement (MOA) with the UC Regents (DOE 2009b), whereby the UC Regents will perform the long-term surveillance and maintenance (LTS&M) of the remedies selected under CERCLA for the DOE areas. DOE is responsible for providing sufficient funding to ensure that the UC Regents can effectively fulfill the LTS&M requirements stipulated in the ROD.

2.1.1 DOE Office of Legacy Management

The DOE Office of Legacy Management ensures that DOE's long-term cleanup obligations are met. The Office of Legacy Management identifies actions and plans, such as this SMP, that are necessary to maintain the protection of a remedy. These actions are documented in an LTS&M Plan (DOE 2005) that states how the requirements of the ROD and remedial implementation work plans, and 5-year review findings shall be met. The LEHR LTS&M Plan defines the requirements for managing and containing soil at the site.

As part of the implementation of the LTS&M Plan, the Office of Legacy Management is responsible for annually reporting to the California Department of Toxic Substances Control (DTSC) and all other signatories to the ROD the status of land-use controls and for conducting 5-year reviews as required by the ROD.

2.2 University of California

2.2.1 UC Regents

The UC Regents have entered into an MOA (DOE 2009b), whereby the UC Regents are responsible for:

- Recording the land-use covenant with DTSC.
- Developing and maintaining internal policies and procedures to ensure that land-use restrictions (such as this SMP) are maintained.
- Visiting sites to ensure that land-use restrictions (such as this SMP) are maintained.
- Developing and providing annual training for campus stakeholders affected by the restrictions (such as this SMP).

2.2.2 UC Davis Administrative and Resource Management Division

The UC Davis Administrative and Resource Management Division provides facilities, land management, and safety services on the UC Davis campus.

2.2.2.1 EH&S Unit

The EH&S Unit within the Administrative and Resource Management Division reviews and approves projects conducted by the Design and Construction Management, Facilities Management, Campus Planning, Community Resources, and other units. The review by EH&S focuses on compliance with safety regulations. For the purpose of this SMP, the EH&S Unit is responsible for communicating the nature and scope of institutional controls applicable to the DOE areas at the LEHR Site to the other units performing or contracting work, and for ensuring that the institutional controls are implemented.

The EH&S Unit shall maintain and make available to interested parties copies of this SMP and the RD/RAWP. The EH&S Unit shall develop and maintain internal policies and procedures to ensure that:

- This SMP and other land-use restrictions are implemented;
- The DOE areas are visited to verify that all land-use restrictions are maintained; and
- Campus stakeholders affected by the restrictions receive annual training.

The EH&S Unit shall review and, upon concurrence from a qualified environmental professional (see Section 2.3), approve all requests for subsurface disturbance at the LEHR Site, and ensure that the appropriate controls are in place before and during soil-disturbing activities. The EH&S Unit shall maintain records of all activities conducted in the DOE areas and shall provide DOE with these records upon request, or as required by this SMP, the RD/RAWP, the ROD, or the MOA between DOE and the UC Regents.

2.2.2.2 Entity Performing Work

The entity that performs work in any DOE area subject to this SMP is responsible for submitting a permit application to the EH&S Unit, a successor unit or organization, or a unit to which EH&S has delegated its responsibilities under the MOA and this SMP, for review and approval before any soil-disturbing activities begin. The entity must also develop all required plans and procedures, and secure appropriate regulatory permits. The entity performing work must conduct all work in conformance with the requirements of this SMP and any requirements imposed by the EH&S Unit or regulatory agencies, and must provide the EH&S Unit with documentation required by this SMP, the Soil Disturbance Permit, and regulatory drivers.

2.3 Environmental Professional

An environmental professional will oversee all soil disturbance activities in the DOE areas subject to this SMP. The environmental professional must be qualified by education, training, or experience—or some combination—to review proposed work in areas subject to this SMP for potential risks; risk controls; waste disposal requirements; and compliance with all applicable laws, regulations, and industry standards, as applicable. For any work proposed for the DOE areas subject to this SMP, the environmental professional shall be responsible for reviewing permits, plans, and documents; advising the EH&S Unit or DOE on the appropriate methods or controls for the work; and overseeing the implementation of all controls required for the work. An environmental professional may be an employee of the University of California or a subcontractor to the University of California or DOE.

3.0 Areas and Contaminants Subject to Soil Management Requirements

This SMP applies to areas where potential contaminants remain in soil (Figure A–3).

As discussed in Section 1.1.1, DOE removed all waste from the DOE areas at LEHR. Small quantities of several contaminants remain in the soil. lists constituents that may be present in site

soils from 0 to 10 feet below ground surface. All contaminants present in soil above background concentrations should be considered when soil is evaluated for on-site reuse or off-site disposal.

Site risks from the residual contamination were quantified and characterized in the site-wide risk assessments (UC Davis 2004, UC Davis 2006, Weiss 2005) that addressed human health, ecological receptors, and groundwater resources. The risk assessments showed that contaminants can remain in DOE areas' soil at concentrations above site background without posing a significant risk, depending on the contaminant's toxicity, mobility, and relative background concentration.

EPA requires that contaminants that may pose an estimated excess cancer risk greater than 1 in 1 million be evaluated further and, possibly, cleaned up. The risk assessments showed that most of the contaminants remaining in soil did not pose such a risk. Risk to the hypothetical on-site resident was below this threshold at DSS 3, Dry Wells A–E, and the Ra/Sr Treatment Systems area. The risk assessments also indicated that the potential risk to on-site construction workers was less than 1 in 1 million at DSS 3; Dry Wells A–E; and the Ra/Sr Treatment Systems, SWT, and EDPs areas.

The risk calculations were based on conservative assumptions. Risk to a hypothetical on-site resident was based on exposure to soil through direct dermal contact, ingestion, inhalation of soil particulates, ingestion of home-grown produce and external radiation from radionuclides in soil. The exposure duration for residents was assumed to extend over 30 years, including 6 years as a child and 24 years as an adult and to occur 350 days per year. Risk to a construction worker was based on exposure to soil through direct dermal contact, ingestion, inhalation of soil particulates and external radiation. The construction worker was assumed to be exposed on 250 days for the duration of 1 year.

The estimated human health risk to a hypothetical on-site resident was above 1 in 1 million for some contaminants at the DSS 4, EDPs, and SWT areas. The highest risk to the hypothetical on-site resident was 4 in 10,000 from benzo(k)fluoranthene at DSS 4, primarily due to ingesting homegrown produce. The ingestion of strontium-90 in homegrown produce also poses slight risks at the SWT area (3 in 1 million) and EDPs area (1 in 1 million). On-site construction workers were estimated to have a 1-in-1-million risk from benzo(a)pyrene in subsurface soil at DSS 4. In Table A–1, constituents of concern, due to potential human health risks, are noted with an "HH." The risk managers decided to address potential risks associated with these constituents through land-use restrictions, including this SMP. The human health risks did not necessitate the implementation of cleanup technology.

The risk assessments indicated that residual contamination in DOE areas presents no significant risks to ecological receptors; consequently, no ecological risk management actions are being taken at the DOE areas. Some contaminants at the DSS 3 and 4, Dry Wells A–E, Ra/Sr Treatment Systems, and SWT areas were found to pose potential risk to groundwater if they were to migrate from site soils to groundwater. DOE is required to monitor groundwater at the site for these constituents (noted with a "GW" in Table A–1) and evaluate the need for remedial action should these contaminants impact groundwater beneath the site. The wells that will be used for this groundwater monitoring are shown on Figure A–3.

Table A–1. Constituents Detected at DOE Areas at Concentrations Above Site Background

Area	Above-Background Constituent	Statistical Basis[a]
Domestic Septic System 3	Cesium-137	Max >UTL
	Lead-210	Max >UTL
	Strontium-90	Max >UTL
	Thallium	Max >UTL
	Zinc	Mann-Whitney (WRS Test)
	1,3-Dichlorobenzene	>5 percent detection
	1,4-Dichlorobenzene	>5 percent detection
	2-Butanone	>5 percent detection
	2-Methylnaphthalene	>5 percent detection
	Acetone	>5 percent detection
	alpha-Chlordane	>5 percent detection
	Aroclor-1254	>5 percent detection
	Benzaldehyde	>5 percent detection
	Bis(2-ethylhexyl)phthalate[b]	>5 percent detection
	Butylbenzylphthalate	>5 percent detection
	Di-n-butylphthalate	>5 percent detection
	Di-n-octylphthalate	>5 percent detection
	Dieldrin	>5 percent detection
	Diethylphthalate	>5 percent detection
	Endrin aldehyde	>5 percent detection
	Formaldehyde [GW]	>5 percent detection
	gamma-Chlordane	>5 percent detection
	Hexachlorobenzene	>5 percent detection
	Isopropylbenzene	>5 percent detection
	Methyl acetate	>5 percent detection
	Pyrene	>5 percent detection
	Styrene	>5 percent detection
	Toluene	>5 percent detection
	Trichlorofluoromethane	>5 percent detection
Domestic Septic System 4	Chromium	Mann-Whitney (WRS Test)
	Lead-210	Max >UTL
	Selenium	Max >UTL
	Strontium-90	Max >UTL
	Uranium-235	Max >UTL
	1,4-Dichlorobenzene	>5 percent detection
	2-Methylnaphthalene	>5 percent detection
	4,4'-DDE	>5 percent detection
	Acenaphthene	>5 percent detection
	Acetone[b]	>5 percent detection
	alpha-Chlordane	>5 percent detection
	Anthracene	>5 percent detection
	Benzo(a)anthracene [HH]	>5 percent detection
	Benzo(a)pyrene [HH]	>5 percent detection
	Benzo(b)fluoranthene [HH]	>5 percent detection
	Benzo(g,h,i)perylene	>5 percent detection

Table A–1 (continued). Constituents Detected at DOE Areas at Concentrations Above Site Background

Area	Above-Background Constituent	Statistical Basis[a]
Domestic Septic System 4 (continued)	Benzo(k)fluoranthene [HH]	>5 percent detection
	Bis(2-ethylhexyl)phthalate[b]	>5 percent detection
	Butylbenzylphthalate	>5 percent detection
	Carbazole	>5 percent detection
	Chlordane	>5 percent detection
	Chrysene	>5 percent detection
	Dibenzo(a,h)anthracene [HH]	>5 percent detection
	Dibenzofuran	>5 percent detection
	Ethylbenzene	>5 percent detection
	Fluoranthene	>5 percent detection
	Fluorene	>5 percent detection
	gamma-Chlordane	>5 percent detection
	Heptachlor	>5 percent detection
	Heptachlor epoxide	>5 percent detection
	Indeno(1,2,3-cd)pyrene [HH]	>5 percent detection
	Methylene chloride[b]	>5 percent detection
	Naphthalene	>5 percent detection
	Phenanthrene	>5 percent detection
	Phenol	>5 percent detection
	Pyrene	>5 percent detection
	Styrene	>5 percent detection
	Toluene	>5 percent detection
	Xylenes	>5 percent detection
Dry Wells A–E	Arsenic	Mann-Whitney (WRS Test)
	Barium	Mann-Whitney (WRS Test)
	Beryllium	Mann-Whitney (WRS Test)
	Carbon-14	Max >UTL
	Cobalt-60	Max >UTL
	Copper	Mann-Whitney (WRS Test)
	Iron	Mann-Whitney (WRS Test)
	Radium-226	Mann-Whitney (WRS Test)
	Selenium	Max >UTL
	Silver	Max >UTL
	Strontium-90 [GW]	Max >UTL
	Thorium-228	Mann-Whitney (WRS Test)
	Thorium-232	Mann-Whitney (WRS Test)
	Thorium-234	Mann-Whitney (WRS Test)
	Uranium-233/234	Mann-Whitney (WRS Test)
	Uranium-238	Mann-Whitney (WRS Test)
	Vanadium	Mann-Whitney (WRS Test)
	Zinc	Mann-Whitney (WRS Test)
	2-Butanone	>5 percent detection
	alpha-Chlordane	>5 percent detection
	Ethylbenzene	>5 percent detection
	gamma-Chlordane	>5 percent detection
	Toluene	>5 percent detection

Table A–1 (continued). Constituents Detected at DOE Areas at Concentrations Above Site Background

Area	Above-Background Constituent	Statistical Basis[a]
Eastern Dog Pens	Chromium	Mann-Whitney (WRS Test)
	Cobalt-60	Max >UTL
	Hexavalent Chromium	Mann-Whitney (WRS Test)
	Lead-210	Max >UTL
	Strontium-90 [HH]	Max >UTL
	Tritium	Max >UTL
	4,4'-DDD	>5 percent detection
	4,4'-DDE	>5 percent detection
	4,4'-DDT	>5 percent detection
	alpha-Chlordane	>5 percent detection
	Aroclor-1254	>5 percent detection
	Chlordane	>5 percent detection
	Dieldrin [HH]	>5 percent detection
	Endrin	>5 percent detection
	gamma-Chlordane	>5 percent detection
Radium/Strontium Treatment Systems	Americium-241	Max >UTL
	Barium	Mann-Whitney (WRS Test)
	Cadmium	Max >UTL
	Carbon-14 [GW]	Max >UTL
	Copper	Mann-Whitney (WRS Test)
	Hexavalent Chromium	Mann-Whitney (WRS Test)
	Iron	Mann-Whitney (WRS Test)
	Plutonium-241	Max >UTL
	Selenium	Mann-Whitney (WRS Test)
	Silver	Max >UTL
	Strontium-90	Max >UTL
	Thallium	Max >UTL
	Thorium-228	Mann-Whitney (WRS Test)
	Vanadium	Mann-Whitney (WRS Test)
	Zinc	Mann-Whitney (WRS Test)
	2-Butanone	>5 percent detection
	4,4'-DDE	>5 percent detection
	4,4'-DDT	>5 percent detection
	Acetone[b]	>5 percent detection
	alpha-Chlordane	>5 percent detection
	Bis(2-ethylhexyl)phthalate[b]	>5 percent detection
	Chlordane	>5 percent detection
	Di-n-butylphthalate	>5 percent detection
	Ethylbenzene	>5 percent detection
	gamma-Chlordane	>5 percent detection
	Methylene chloride[b]	>5 percent detection
	Toluene	>5 percent detection
	Xylenes	>5 percent detection

Table A–1 (continued). Constituents Detected at DOE Areas at Concentrations Above Site Background

Area	Above-Background Constituent	Statistical Basis[a]
Southwest Trenches	Americium-241	Max >UTL
	Antimony	Max >UTL
	Barium	Mann-Whitney (WRS Test)
	Carbon-14 GW	Max >UTL
	Cesium-137	Max >UTL
	Cobalt-60	Max >UTL
	Hexavalent Chromium	Mann-Whitney (WRS Test)
	Iron	Mann-Whitney (WRS Test)
	Lead-210	Max >UTL
	Plutonium-241	Max >UTL
	Selenium	Max >UTL
	Silver	Max >UTL
	Strontium-90 HH	Max >UTL
	Thorium-228	Mann-Whitney (WRS Test)
	Tritium	Max >UTL
	Vanadium	Mann-Whitney (WRS Test)
	Zinc	Mann-Whitney (WRS Test)
	2-Butanone	>5 percent detection
	4,4'-DDD	>5 percent detection
	4,4'-DDE	>5 percent detection
	4,4'-DDT	>5 percent detection
	alpha-Chlordane	>5 percent detection
	Dieldrin	>5 percent detection
	Ethylbenzene	>5 percent detection
	Formaldehyde	>5 percent detection
	gamma-Chlordane	>5 percent detection
	Heptachlor	>5 percent detection
	Heptachlor epoxide	>5 percent detection
	Toluene	>5 percent detection
	Xylenes	>5 percent detection

Notes:
[a] Background test results for inorganic constituents in soil from 0 to 10 feet below ground surface. The organic constituent background level is 0. Organic constituents are assumed to exceed background if the frequency of detection was 5 percent or more. Inorganic constituent statistical test results and the organic constituent frequency of detection are taken from the *Revised LEHR/SCDS Site-Wide Risk Assessment, Volume I: Human Health Risk Assessment* (UC Davis 2004).
[b] Common laboratory contaminant.

Abbreviations:
>5 percent Detection = Organic
DDD = Dichlorodiphenyldichloroethane
DDE = Dichlorodiphenyldichloroethylene
DDT = Dichlorodiphenyltrichloroethane
DSS = Domestic Septic System
EDPs = Eastern Dog Pens
GW = Constituent of concern with potential to impact groundwater quality (DOE 2009a)
HH = Human health constituent of concern (DOE 2009a)
Mann-Whitney (WRS Test) = Constituent is above background based on results of Mann-Whitney statistical test (also known as Wilcoxon Rank Sum test).
Max >UTL = Maximum detected concentration is above the background upper tolerance limit (80 percent lower confidence limit on the 95th percentile).
Ra/Sr = Radium/Strontium
SWT = Southwest Trenches
WRS = Wilcoxon Rank Sum

4.0 Soil Management During Excavation or Construction

Soil with residual contamination may be encountered during maintenance, excavation, trenching, and other soil-disturbing activities at DOE areas at LEHR. All personnel, whether UC staff or contractors, conducting excavation, digging, or other soil-disturbing operations must be made aware that there is a potential for encountering contamination, and must know the procedures for dealing with contamination. All soil-disturbing activities at DOE areas subject to this SMP (except emergency activities) shall be conducted under the oversight of an environmental professional and shall follow the process illustrated in Figure A–4 and described below. Section 5.0 discusses emergency work.

4.1 Pre-Excavation and Pre-Construction Activities

4.1.1 Permit for Soil-Disturbing Activities

Before any soil-disturbing activities are conducted at the DOE areas, the UC Davis EH&S Unit shall be notified of the nature and location of the work to be performed. A permit application (Attachment D)—detailing the nature of the project; the project's location; and the expected depth of any proposed trenching, excavation, drilling, or other soil disturbance—shall be submitted to the EH&S Unit. No work may begin until the EH&S Unit approves the permit for the proposed project.

The EH&S staff will review the proposed work locations to determine whether the work may occur in areas subject to this SMP. In conducting this review, survey maps for the DOE areas subject to land-use restrictions shall be used. If the proposed work may be conducted in areas subject to the SMP, the EH&S Unit will ensure that the UC Davis unit or contractor performing the work is aware of all of the requirements of this SMP and will work with the unit to ensure compliance. The EH&S Unit and the environmental professional will also assist the entity performing the work in determining whether any preconstruction soil sampling is required based on the intended disposition of the soil, available contaminant data, off-site disposal facility acceptance requirements, and other factors. As outlined in the Soil Disturbance Permit (Attachment D), soil disturbed at 0–10 feet below ground surface will be sampled for constituents in Table A–1 as appropriate based on location. Soil disturbed at >10 feet below ground surface will be sampled for constituents determined by professional judgment to be potentially present in the soil in concentrations above site background, based on the data presented in Attachment C.

4.1.2 Project Evaluation and Site Inspection

An evaluation of the proposed project will be conducted by the EH&S Unit and an environmental professional, and will consist of a review of all available data, including survey maps and contaminant distribution data provided in this SMP (Section 3.0 and Attachments A and B) to determine the appropriate requirements regarding health and safety, storm water, and waste disposal. Because some of the residual contaminants are potentially subject to migration and degradation or decay, additional data and/or estimates of environmental fate and transport of residual contaminants will be considered by the EH&S Unit and environmental professional in the soil management planning process Information regarding residual contamination distribution

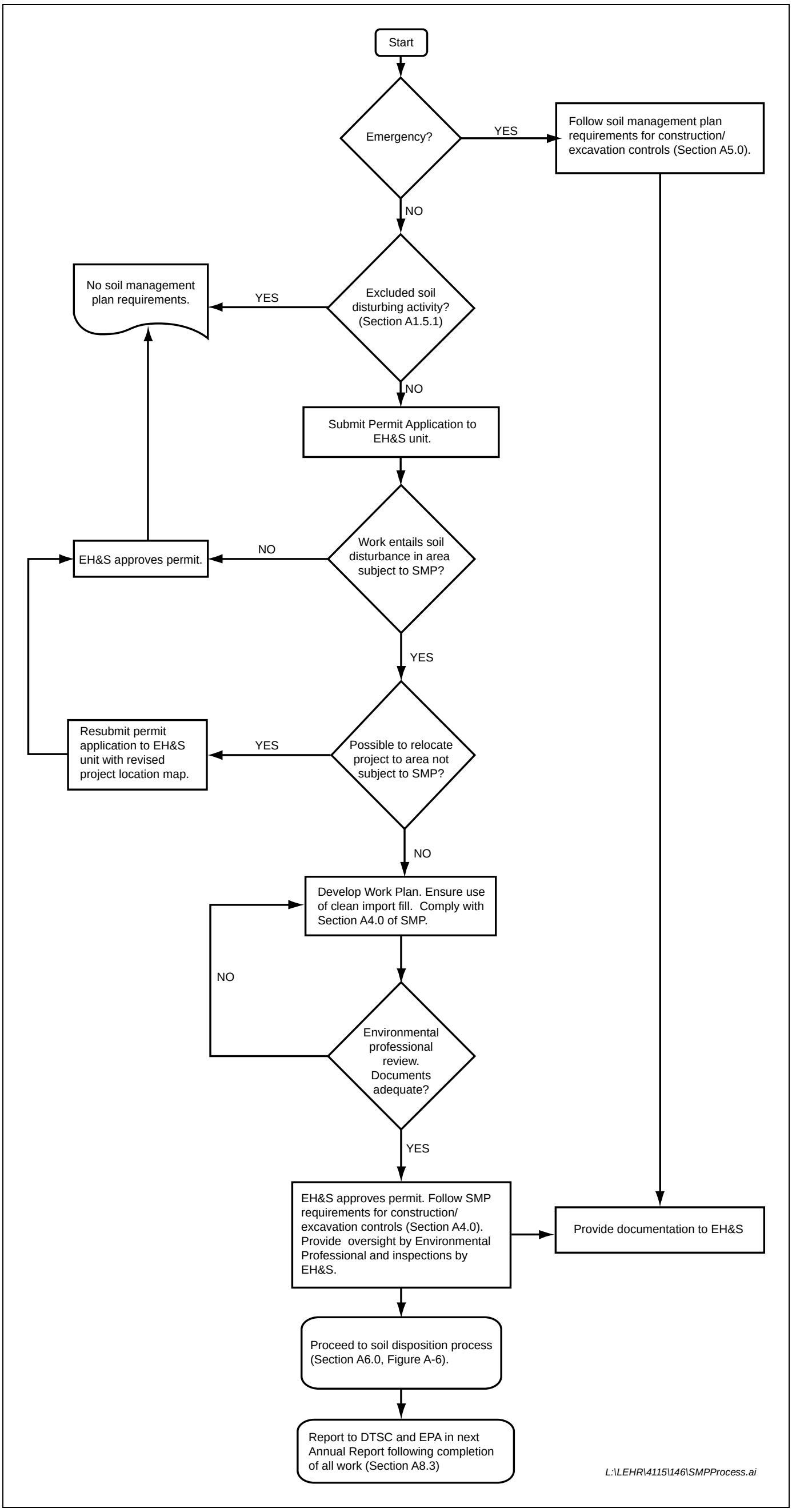

Figure A–4. Process for Conducting Non-emergency Work at the DOE Areas of the Laboratory for Energy-Related Health Research

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and fate and transport is included in the Risk Characterization Report (Weiss 2005), which may be obtained from the EH&S Unit, DOE Office of Legacy Management, or EPA.

Before any soil-disturbing activities are conducted at the DOE areas subject to this SMP, the EH&S Unit will—with the UC Davis unit or contractor performing the proposed work—inspect the site to physically identify areas of the proposed work that will be subject to the requirements of this SMP. If it is possible to move the proposed work to an area that is not subject to this SMP, or to an area with more-limited residual contamination, the EH&S Unit will recommend such a move, to avoid disturbing contaminated soils.

4.1.3 Control of Work Area

Before any soil-disturbing activities are conducted at the DOE areas subject to this SMP, the UC Davis unit or contractor performing the work shall secure the work area to limit access to only those staff that are authorized and trained to work there.

4.1.4 Training

All staff who will conduct soil-disturbing activities at the DOE areas subject to this SMP must receive appropriate training regarding the contaminants that might be present, the associated health hazards and hazard controls, soil-handling and waste-management requirements, and emergency procedures. As required by law and depending on their assignment, site workers shall be trained in hazardous waste operations and emergency response in accordance with the requirements of Title 29 *Code of Federal Regulations* Section 1910.120 and Section 5192 of Title 8 *California Code of Regulations*. Specific training requirements shall be included in work plans and Health and Safety Plans discussed below.

UC Davis implements a Safety Management Program described in the UC Davis Policy and Procedure Manual, Chapter 290, Health and Safety Services, Section 15[1]. The training related to soil-disturbing activities in the DOE areas subject to the SMP will be incorporated into this Safety Management Program.

4.1.5 Required Plans and Documentation

Before soil-disturbing activities are conducted, a work plan that covers the following topics shall be developed and approved:

- Health and safety
- Soil moving and storage procedures, including equipment to be used
- Soil sampling and analysis
- Waste management

The work plan should be tailored to the scope of the activity to be performed. Appropriate permits shall be obtained for the work to be performed.

[1] The Policy and Procedure Manual can be found at http://manuals.ucdavis.edu/PPM/290/290-15.htm

All plans for soil-disturbing activities must be reviewed by an environmental professional and approved by the EH&S Unit.

4.1.5.1 Health and Safety

The health and safety element of the work plan should address potential exposure to site contaminants and provide requirements to control such exposure, including appropriate engineering and administrative controls and personal protective equipment.

4.1.5.2 Soil Sampling and Analysis

The sampling and analysis element should be developed to ensure that samples are collected in conformance with EPA data-quality requirements, and meet the needs of the waste disposal facility in the case of off-site disposal.

4.1.5.3 Waste Management

The waste management element should include procedures for segregating, characterizing, handling, storing, treating (if anticipated), and disposing of waste. Requirements for the proper disposal of investigation-derived waste and decontamination waste shall be included. The cost of disposing of low-level radioactive waste containing chemical contaminants can be significantly higher than the cost of disposing of soil with added radiological constituents, or soil containing only chemical contamination or no contamination. Soil with added radiological constituents should be segregated from soil containing only chemical contamination or no contamination. Soil determined to be hazardous shall be transported by a licensed hauler to a permitted hazardous waste disposal facility. Soil determined to be radioactive waste or mixed radioactive waste shall be transported to a disposal facility permitted to accept radioactive or mixed waste.

4.1.6 Excavation and Construction Activities

Excavation and construction activities shall be performed in a manner that minimizes worker exposure and protects the environment from site contaminants. A designated work area boundary shall be established for excavation and construction activities.

4.1.7 Waste Segregation

Waste areas shall be secured and posted. Soil from the top 1 foot below ground surface shall be segregated and returned to backfill the top of the excavation if soils will not be sampled. Soil with added radiological constituents should be segregated from soil containing only chemical contamination or no contamination. To facilitate preliminary waste segregation decisions in DOE soil management areas, Attachments A and B provide the existing soil analytical data. The data should be used to evaluate the types of contaminants that might be present and to plan excavation, soil-handling, stockpiling, and disposal activities. The evaluation and segregation approaches should be conducted or reviewed by the environmental professional.

4.1.8 Unexpected Conditions

Excavation, digging, or other soil-disturbing activities should immediately cease upon the discovery of potentially contaminated soil or other material in an area not previously identified as containing residual contaminants or contaminated features (e.g., underground sumps, underground tanks, underground drain lines suspected of containing contamination, laboratory waste). Evidence of potentially contaminated soil or other material includes, but is not limited to:

- Discolored soil;
- Odors;
- Readings on monitoring equipment (e.g., Photoionization Detector) indicating potential presence of contaminants;
- Laboratory glassware, chemical vials, bottles or other containers;
- Drums or carboys;
- Other laboratory equipment;
- Animal wastes or bones;
- Pipes or other debris that appear to be part of an underground waste management system, such as a sump, underground tank, leach field, and so on.

The EH&S Unit must be immediately notified of the discovery.

If an excavation, digging, or other soil-disturbing activity results in an encounter with unexpected contamination identified as a CERCLA hazardous substance, notice will be promptly provided to DOE, EPA Region 9, DTSC, the California Regional Water Quality Control Board, and the California Department of Public Health so that a determination can be made regarding the need for a CERCLA response or further investigation.

4.1.9 Soil Stockpile Management

Soil stockpiles, if used, shall be placed on top of heavy-duty plastic sheeting. Wherever possible, excavated soil will be stockpiled on areas with improved asphalt or concrete surface. Potentially hazardous or radioactive waste will be stored in a designated area. Unauthorized access to such areas will be prevented by fencing or other means. Soil stockpiles shall be covered with material adequate to prevent soil transport by wind or rainwater runoff. Covers shall be maintained in good condition. When not covered, soil stockpile surfaces will be kept visibly moist by water spray, as necessary.

4.1.10 Dust Control

Dust-control measures shall be implemented in compliance with all applicable laws and regulations. During excavation, all exposed soil surfaces shall be kept visibly moist by water spray, or covered with continuous heavy-duty plastic sheeting or other covering to minimize emissions of particulates into the atmosphere. Wind speed will be monitored during excavation activities using an anemometer positioned in an open area within 200 feet of the excavation. Excavation activities shall be suspended when winds (instantaneous gusts) exceed 25 miles per hour.

Parking areas, staging areas, and traffic pathways on the site shall be cleaned as necessary to control dust emissions. Adjacent public streets shall also be cleaned if necessary when soil material from the site is visible. Soil loaded into transport vehicles for off-site disposal shall be covered with tarps or other covering to minimize emissions into the atmosphere. The covering shall be in good condition, joined at the seams, and securely anchored.

Real-time dust monitoring shall be performed at a minimum safe distance down-wind of the activity. The monitoring will be conducted to ensure that dust levels are maintained below applicable standards, such as the Yolo Solano Air Quality Management District Regulation II, Rule 2.3, Ringelmann Chart, which prohibits discharge into the atmosphere of any air pollutant, for a period or periods aggregating more than three (3) minutes in any one (1) hour which is:

a. As dark or darker in shade as that designated as No. 1 on the Ringelmann Chart, as published by the United States Bureau of Mines; or 400

b. Of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in subsection 301.2 a. of this rule.

4.1.11 Surface Water Protection

Excavated soil shall be managed in a way that will not cause sediment to enter storm water runoff. Excavated soil that is suspected or known to be contaminated shall be placed in sealed containers or stockpiled and covered. The best management practices listed below shall be applied to any excavation or construction work in the DOE areas subject to this SMP. Other best management practices may be necessary depending on the nature and location of the proposed project—as determined by the EH&S Unit, the environmental professional, or both. Best management practices include:

- Designating a completely contained area away from storm drains for refueling or maintenance work that must be performed at the site.
- Cleaning up all spills and leaks using dry methods (e.g., absorbent materials, rags).
- Dry-sweeping dirt from paved surfaces, for general cleanup.
- Protecting storm drains, using earth dikes, straw bales, sandbags, absorbent socks, or other controls to divert or trap and filter runoff.
- Shoveling or vacuuming saw-cut slurry and removing it from the site.
- Not allowing rainfall or runoff to contact contaminated soil or debris.
- Scheduling excavation work for dry-weather periods, when possible.

- Avoiding over-application by water trucks for dust control.
- Protecting the area from rainfall and preventing runoff by using heavy-duty plastic and temporary roofs and berms.

4.1.12 Construction and Excavation Equipment Decontamination

Decontamination procedures protect workers from contaminants that may have accumulated on tools and other equipment. Proper decontamination also prevents the transport of potentially harmful materials to uncontaminated areas.

Construction and excavation equipment, such as drilling and excavating vehicles, shall be decontaminated at a designated location (i.e., a decontamination zone). The chosen location should be readily accessible and should be downwind and downgradient of work areas. Gross decontamination should be performed using a brush to loosen dirt and then a pressure washer or other suitable means. Cleaning and decontamination water shall be captured and placed in containers to prevent runoff from leaving the immediate work site.

All wastewater generated from decontamination activities shall be sampled and disposed of in accordance with local, State, or federal requirements. Wastewater shall be discharged to the sanitary sewer in accordance with the requirements of the UC Davis Wastewater Treatment Plant. Discharges of pollutants into the storm drain system, waters of the State, or the environment are prohibited, unless a permit is in place to allow such discharges.

4.1.13 Worker Safety

Safety measures shall be implemented in accordance with the health and safety element of the work plan or a site Health and Safety Plan.

Open excavations will be demarcated with barricades and caution tape during periods of inactivity and at the end of each workday to reduce the potential of personnel falling into the excavations. The excavations will be maintained to mitigate physical hazards to personnel working in or entering the area after work is completed.

4.2 Imported Soil Backfill

Soil for backfill may be imported from either on-site or off-site sources if soil shortages occur. Imported backfill must be sampled to ensure that contamination is not inadvertently brought onto the site. The project requestor must submit a Sampling and Analysis Plan to the EH&S Unit for approval prior to importing any material. The sampling protocol will require one 5-point composite sample for every 500 cubic yards of imported soil. For volatile organic compounds only, an individual sample will be collected according to EPA Method 5035 from each composite point, and each will be analyzed separately. At a minimum, all samples will be analyzed for the following parameters[2]:

- Soil Moisture by ASTM D2216 or equivalent,
- Metals (CAM 17) by EPA SW846 Method 6020,

[2] The current version of the method posted in EPA's updated SW846 at the time of sampling will be used. All analytic results for imported backfill should be reported based on dry weight with percent moisture reported so the results can be converted to wet weight basis when required.

- Mercury by SW846 Method 7470
- Volatile organic compounds by SW846 Method 8260,
- Semivolatile organic compounds by SW846 Method 8270,
- Pesticides by SW846 Method 8081,
- Polychlorinated biphenyls (PCBs) by SW846 Method 8082,
- Total petroleum hydrocarbons by SW846 Methods 8015M/8020,
- Nitrate by SW846 Method 300.1, and
- Hexavalent chromium by SW846 Method 7199.

The Sampling and Analysis Plan will name the analytical laboratory(ies) that will conduct the analyses, and will provide the Quality Assurance Plan, Standard Operating Procedures for the specified analyses, and tables showing reporting limits and method detection limits (MDLs) for all analytes. To the extent practical, all reporting limits should meet the detection levels shown on Table A–2. All MDLs must meet these detection levels.

The analytical data, including that for radiological constituents, will be reviewed by the environmental professional to determine whether the import soil is acceptable for use as backfill. The EH&S Unit shall approve the use of imported fill before soil is imported from either on-site or off-site sources.

5.0 Soil Management During Emergency Work

Emergency excavation or soil-disturbing activities that are required to protect human health, the environment (e.g., a broken gas line), or property may be performed in the DOE areas as required. Residual contaminants at the DOE areas do not pose a short-term threat to human health or the environment. The process illustrated in Figure A–5 shall be followed for emergency work.

When practicable, the entity conducting emergency activities shall notify the EH&S Unit of the work. The EH&S Unit will provide guidance and may monitor the emergency excavation or soil-disturbing activities. Excavated soils must be placed in containers or stockpiled—or both—at the work site on an impervious surface (e.g., tarps, heavy-plastic sheeting), must have proper storm water controls, and must be protected from wind erosion and inclement weather until they can be evaluated for proper disposal. If immediate backfilling is necessary as part of the emergency response, soils excavated during emergency activities may be returned to the excavation; otherwise, soil excavated during the emergency will be evaluated as excavated waste according to the procedures in Section 6.0 and Figure A–6 after the emergency response is concluded. If the excavated soil (stockpiled, containerized, or returned to the excavation)is determined unacceptable for reuse, it will be removed and properly disposed of. The excavated soil will be replaced with imported backfill that has been tested and approved as acceptable as specified in Section 4.3 above.

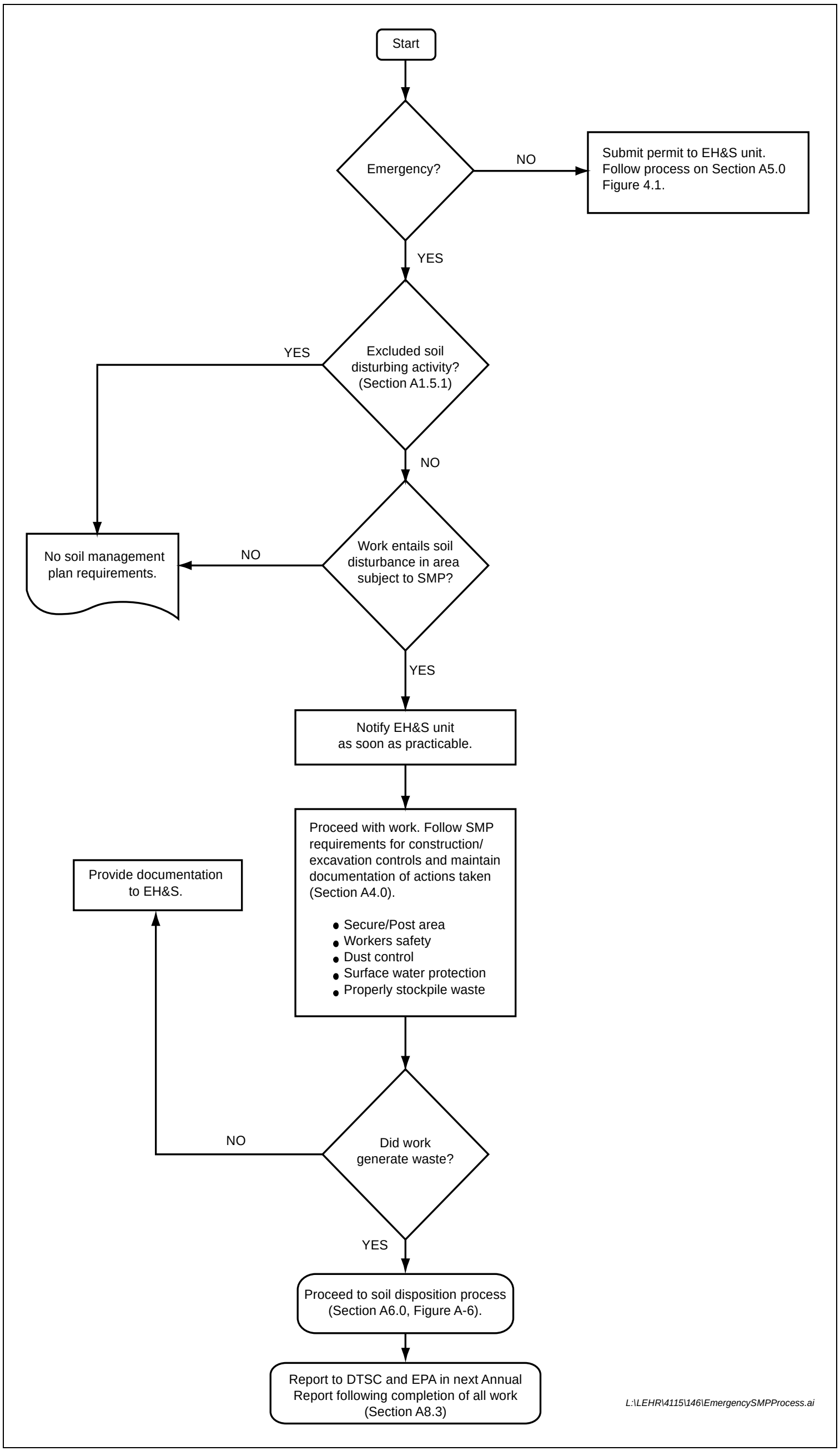

Figure A–5. Process for Conducting Emergency Work at the DOE Areas of the Laboratory for Energy-Related Health Research

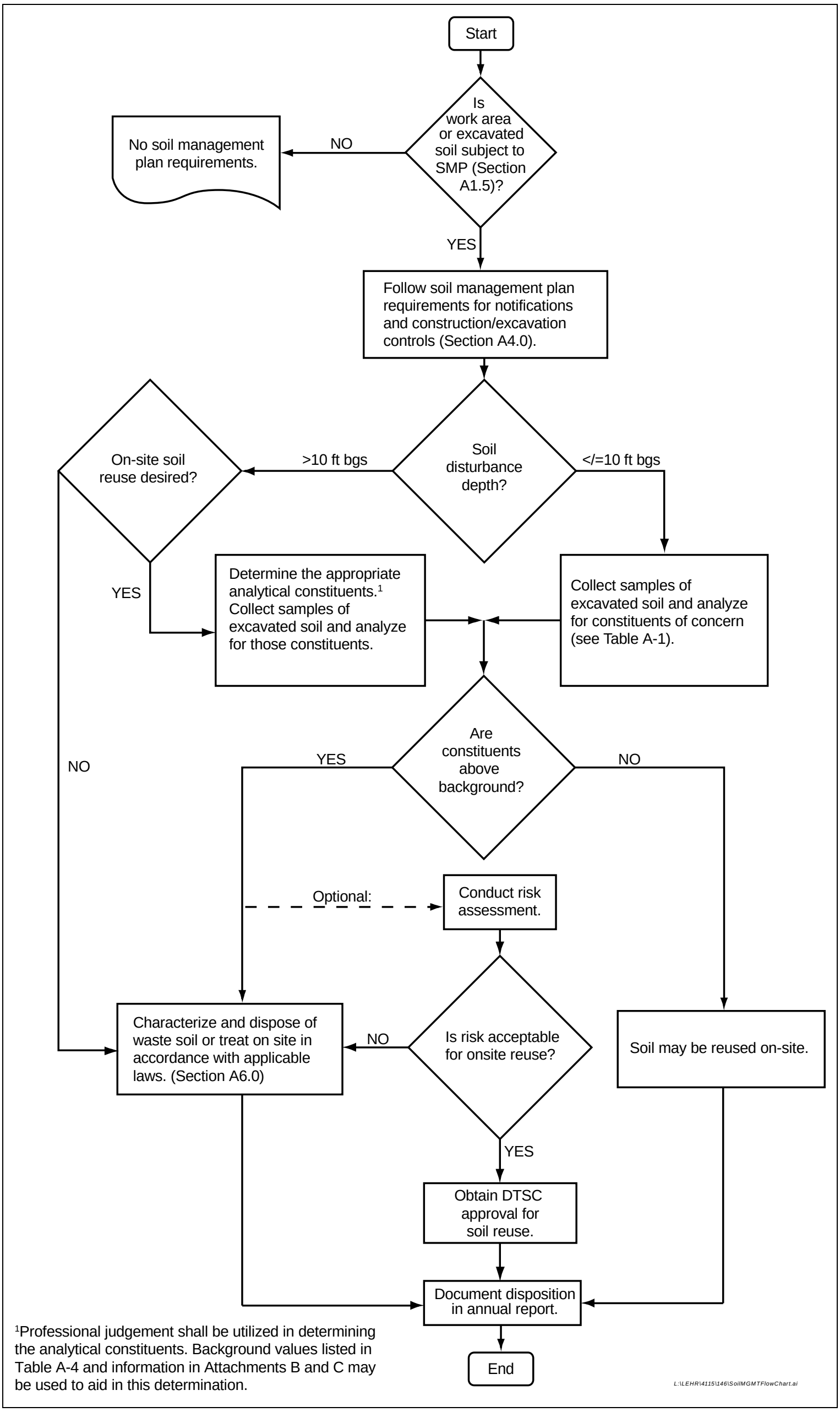

Figure A–6. Decision Process for Disposal of Excavated Soil

Table A–2. Laboratory Analysis Parameters, Analytical Methods, Containers, Holding Times, and Required Detection Limits for Soil/Solid Waste Samples

Parameter (Container)	Analytical Method[a]	Required Detection Limit (pCi/g for radiochemicals, mg/kg for metals/general chemistry)	Holding Time	DOE Area
Laboratory Analyses				
Radionuclides (16-ounce glass [2 each]):				
Americium-241	EML HASL 300[b]	0.01	6 months	Ra/Sr, SWT
Carbon-14	EPA EERF C-01[c]	0.1	6 months	Ra/Sr, Dry Wells, SWT
Gamma Emitters	—	—	—	
Cesium-137	EPA 901.1	0.005	6 months	DSS 3, Dry Wells, SWT
Cobalt-60	EPA 901.1	0.005	6 months	Dry Wells, EDPs, SWT
Lead-210	EPA 901.1	1	6 months	DSS 3, DSS 4, EDPs, SWT
Radium-226[d]	EPA 901.1	0.05	6 months	Ra/Sr, Dry Wells
Thorium-234	EPA 901.1	0.5	6 months	Dry Wells
Plutonium-241	EML HASL 300[b]	0.5	6 months	Ra/Sr, SWT
Strontium-90	EPA Method 905.0[e]	0.05	6 months	Ra/Sr, DSS3, DSS4, Dry Wells, EDPs, SWT
Tritium	EPA Method 906.0[f]	1	6 months	EDPs, SWT
Thorium-228	EML HASL 300[b]	0.1	6 months	Ra/Sr, Dry Wells, SWT
Thorium-232	EML HASL 300[b]	0.05	6 months	Dry Wells
Uranium-233/234	EML HASL 300[b]	0.025	6 months	Dry Wells
Uranium-235	EML HASL 300[b]	0.01	6 months	DSS 4
Uranium-238	EML HASL 300[b]	0.025	6 months	Dry Wells
Metals (4-ounce glass [2 each]):				
Antimony	SW-846, Method 6020A[g]	1	6 months	SWT
Arsenic	SW-846, Method 6020A[g]	1	6 months	Dry Wells
Barium	SW-846, Method 6020A[g]	40	6 months	Ra/Sr, Dry Wells, SWT
Beryllium	SW-846, Method 6020A[g]	0.1	6 months	Dry Wells
Cadmium	SW-846, Method 6020A[g]	0.1	6 months	Ra/Sr
Chromium (total)	SW-846, Method 6020A[g]	1	6 months	DSS 4, Dry Wells, EDPs
Copper	SW-846, Method 6020A[g]	1	6 months	Ra/Sr, Dry Wells
Iron	SW-846, Method 6020A[g]	20	6 months	Ra/Sr, Dry Wells, SWT

Table A–2 (continued). Laboratory Analysis Parameters, Analytical Methods, Containers, Holding Times, and Required Detection Limits for Soil/Solid Waste Samples

Parameter (Container)	Analytical Method[a]	Required Detection Limit (pCi/g for radiochemicals, mg/kg for metals/general chemistry)	Holding Time	DOE Area
Laboratory Analyses				
Mercury	SW-846, Method 7471[g]	0.1	28 days	Dry Wells
Molybdenum	SW-846, Method 6020A[g]	0.1	6 months	DSS 3, Dry Wells
Selenium	SW-846, Method 6020A[g]	1	6 months	Ra/Sr, DSS 4, Dry Wells, SWT
Silver	SW-846, Method 6020A[g]	0.25	6 months	Ra/Sr, Dry Wells, SWT
Thallium	SW-846, Method 6020A[g]	0.5	6 months	Ra/Sr, DSS 3
Vanadium	SW-846, Method 6020A[g]	1	6 months	Ra/Sr, Dry Wells, SWT
Zinc	SW-846, Method 6020A[g]	1	6 months	Ra/Sr, DSS 3, Dry Wells, SWT
General Chemistry (4-ounce glass)				
Hexavalent Chromium	SW-846, Method 3060A/7196[g]	0.1	24 hours	Ra/Sr, Dry Wells, EDPs, SWT
Nitrate	EPA Method 300.0[h]	1	48 hours	Ra/Sr, DSS 3, SWT
Organics:				
Volatile Organic Compounds (VOA vials [4 each] [12 VOA vials for MS/MSD samples])	SW-846, Method 8260/5035[g]	See Table A–3	14 days Na bisulfate methanol	Ra/Sr, DSS 3, DSS 4, Dry Wells, SWT
Semivolatile Organic Compounds (4-ounce glass)	SW-846, Method 8260[g]	See Table A–3	14 days to extraction, 40 days to analysis of extract	Ra/Sr, DSS 3, DSS 4
Pesticides/Polychlorinated Biphenyls (4-ounce glass)	SW-846, Method 8081/8082[g]	See Table A–3	14 days to extraction, 40 days to analysis of extract	Ra/Sr, DSS 3, DSS 4, Dry Wells, EDPs, SWT
Formaldehyde (125-milliliter wide-mouth amber glass)	SW-846, Method 8315[g]	0.1	7 days	DSS 3, SWT

Table A–2 (continued). Laboratory Analysis Parameters, Analytical Methods, Containers, Holding Times, and Required Detection Limits for Soil/Solid Waste Samples

Notes:
[a] Or equivalent method. The laboratory must be certified through the California Department of Public Health. If the soil will be disposed of outside of California, the laboratory must also be certified in the state of the disposal facility.
[b] From *The Procedures Manual of the Environmental Measurements Laboratory* (DHS 1997).
[c] *Tritium* from *Prescriptive Procedures for Measurement of Radioactivity in Drinking Water* (EPA 1980).
[d] Requires 30-day in-growth time and 1,000-minute count time.
[e] *Radioactive Strontium* from *Prescriptive Procedures for Measurement of Radioactivity in Drinking Water* (EPA 1980).
[f] EPA, *Eastern Environmental Radiation Facility* (EERF).
[g] From *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA 2007).
[h] *Determination of Inorganic Anions by Ion Chromatography* (EPA 1993).

Abbreviations:
EPA = U.S. Environmental Protection Agency
mg/kg = Milligrams per kilogram
pCi/g = Picocuries per gram
Ra/Sr = Radium/Strontium Treatment Systems
DSS3 = Domestic Septic System 3
DSS4 = Domestic Septic System 4
Dry Wells = Domestic Septic System Dry Wells A–E
EDPs = Eastern Dog Pens
SWT = Southwest Trenches

When emergency excavation or soil-disturbing activities occur, the extent of the emergency work shall be documented, including the date the work was performed, who performed the work, the nature of the work, the volumes of soil disturbed, the nature and extent of any contamination discovered, the final disposal of any soils, and the resolution of the emergency situation. The documentation shall be submitted to the EH&S Unit within 30 days of the event. Waste that was generated during any emergency activity and that disturbs potential contaminated soils in the DOE areas subject to this SMP must be managed in accordance with the requirements of Section 6.0.

6.0 Characterization and Disposal of Excavated Waste

This section provides requirements and a process for managing the disposal of waste soils (clean or contaminated) generated during maintenance, construction, excavation, and similar activities, and provides a process for determining how excavated soils shall be disposed of. Waste designation criteria and sampling and analysis specifications are included to ensure that a method consistent with the LEHR ROD is used in making decisions.

6.1 Soil Designation Categories

Waste soil may be categorized as follows:

- Clean—Soil that contains constituents at or below site background concentrations.
- Nonhazardous—Soil with no added radioactivity and detectable levels of hazardous substances that are above background but below applicable federal and California hazardous waste standards.
- Hazardous—Soil with levels of hazardous substances above applicable federal and California hazardous waste standards.
- Radioactive—Soil with activities of radionuclides above site background levels.

Soil must be disposed of according to its categorization.

6.2 Soil Characterization

Figure A–6 summarizes the soil-management process. All soil excavated from DOE areas subject to soil management requirements (Figure A–3) must be characterized to determine if the soil is clean, nonhazardous, hazardous, or radioactive (see Section 6.1). Samples of excavated soil must be analyzed for waste characterization purposes. Sufficient data must be collected to meet the waste acceptance criteria of a disposal facility if the soil will not be reused on site.

6.2.1 Soil Sample Collection

Before samples are collected, the project requestor must submit to the EH&S Unit a project-specific Sampling and Analysis Plan (an element of the Work Plan). The EH&S Unit will review the Sampling and Analysis Plan and determine its adequacy.

Depending on the type of work to be conducted, the Sampling and Analysis Plan shall specify whether samples will be collected during waste generation or upon generation of stockpiles, and specify sample-collection techniques. The plan shall state that a minimum of one sample per 50 cubic yards be collected. Sample densities must also fulfill disposal facility waste acceptance requirements if soil is not to be reused on site. The plan shall specify procedures for decontaminating sampling equipment prior to sampling and between sampling locations. The plan shall also include a requirement for collecting duplicate samples for quality control purposes at a rate of at least 10 percent.

To ensure sample integrity, samples shall be handled using complete chain-of-custody documentation and preserved using proper sample preservation techniques, holding times, and shipment methods. All samples should be identified by unique sample identification (ID) numbers. Samples should be properly labeled and packaged for shipment along with appropriate documentation. Table A–2 lists recommended container types, volume, sample preservation methods, and holding times.

6.2.2 Soil Sample Analysis

Soil samples shall be analyzed in accordance with the Sampling and Analysis Plan that has been reviewed and accepted by an environmental professional and approved by the EH&S Unit. The analytical suite shall be chosen using sound professional judgment and shall reflect the project's needs for data, taking into account the potential contamination present at the project location. All results shall be reported on a dry weight basis and moisture content shall also be reported. Results can be corrected to a wet-weight basis for comparison to waste disposal criteria and California hazardous waste thresholds. Data provided in this SMP are resources to aid the determination of a defensible analytical strategy.

For characterization of soil generated during work conducted in the 0-to-10-foot below ground surface soil horizon, constituents historically detected in concentrations above background (see Table A–1) should be considered in selecting the analytical suite. The list in Table A–1 includes inorganic constituents with statistical test results indicating concentrations above site background, and organic constituents with a detection frequency of 5 percent or more. The list is based on data from soil samples collected between 0 and 10 feet below ground surface (UC Davis 2004).

Attachment A provides more-detailed information about constituents detected in soil in the 0-to-10-foot below ground surface soil horizon. The data in Attachment A represents post-removal-action conditions; however, it may not reflect current conditions for constituents that are subject to degradation, chemical transformation, or transport.

Additional constituents, including constituents of concern identified in the ROD as having a potential impact to human health or groundwater quality, may be present in concentrations above site background in soil below 10 feet. As illustrated in Figure A–6, soil excavated at depths below 10 feet below ground surface can be either shipped off site for disposal or evaluated for on-site reuse. A depth-specific evaluation of existing data may be conducted to determine which constituents should be analyzed in excavated soils. Attachment C provides existing analytical data for soil samples collected at the DOE areas subject to this SMP and data for soil samples collected at background locations. The data in Attachment C contains analytical results for all samples collected between the ground surface and the deepest depth explored. The data in

Attachment C represents post-removal-action conditions; however, it may not reflect current conditions for constituents that are subject to degradation, chemical transformation, or transport.

All samples must be analyzed by a laboratory certified in the State of California and the state of the waste disposal. Analyses performed must meet the requirements of the waste disposal facility if the waste is not to be reused on site.

Table A–2 specifies analytical methods and required detection limits for characterization analyses. The Sampling and Analysis Plan will name the analytical laboratory(ies) that will conduct the analyses, and will provide the laboratory(ies) Quality Assurance Plan, Standard Operating Procedures for the specified analyses, and tables showing reporting limits and MDLs for all analytes. To the extent practical, all reporting limits should meet the detection levels shown on Table A–2. All MDLs must meet these detection levels.

6.2.2.1 Data Quality Assessment

All data generated for the purpose of characterizing excavated soil must be assessed to verify that the data meet the quality requirements in Section 10.2 of the QAPP. A detailed approach to assess data quality shall be specified in the sampling and analysis plans; however, data quality issues that will likely occur for soil sampling data are discussed in this section.
First, the data must be reviewed to verify that they meet the quality objectives specified in Section 7.1 of the Remedial Design/Remedial Action Work Plan. The data shall be valid for determining the disposition of any soil that has been disturbed, including waste segregation, reuse, and disposal requirements. New and existing data will be used to:

- Identify waste segregation strategies;
- Develop appropriate worker health and safety controls;
- Identify materials recycling opportunities; and
- Appropriately dispose of sanitary, hazardous, low-level radioactive, and low-level mixed waste generated during soil-disturbing activities.

Data quality assessment begins with validation of the sample data used in the characterization. The validation shall be performed in accordance with the procedures in SOP 21.1. It should be noted that existing soil data were validated by the Project Chemist with the data qualifications presented in Attachment C.

As part of the validation process, precision and accuracy will be assessed through validation of sample duplicates, calibrations, and spike samples. The parameter that will be used to validate precision is the relative percent difference (RPD). The RPD is used to determine whether a significant difference exists between duplicate samples, including matrix spike duplicates, laboratory control sample duplicates, and field duplicate samples. Other approaches to assessing precision involve statistical calculations or graphical representations that may be conducted after the data are validated. Acceptance limits for the RPDs of matrix spike duplicates, laboratory control sample duplicates, and field duplicates are provided in SOP 21.1.

Accuracy will be assessed through validation of spike recovery and instrument calibration. Acceptance limits for matrix spike recovery, laboratory control sample spike recovery, and calibration parameters provided in SOP 21.1 shall be used. Depending on the analysis method

and analyte, a review of linearity in the calibrated range, detector response, reference standards, and continuing calibration check standards shall be performed.

Data representativeness will be achieved through the careful, informed use of existing data and the collection of representative samples to support soil management decisions. Sample locations and rationale will be addressed in the sampling and analysis plans developed before soil-disturbing activities are conducted (see Section 4.1.5) for non-emergency work. Representativeness will also be achieved through the proper collection and handling of samples to avoid interferences and to minimize contamination and loss (see SOPs 1.1, 2.1, and 9.1).

Comparability among measurements will be achieved through the use of standard procedures and standard field data sheets presented in the project SOPs (see Appendix I of the Remedial Design/Remedial Action Work Plan).

The completeness goal for samples collected to support future soil management decisions is 90 percent unless stated otherwise in project-specific work plans. This goal is per analyte per project. If project data are rejected during data validation and the completeness goal is not met, additional samples will be collected, if necessary, to provide sufficient data. When the data are validated and complete, they will be made available to data users for comparisons, calculations, and graphical representations to support project decisions.

Most soil disturbance decisions will rely on comparisons of sample data to background and/or risk-based standards. A screening comparison of maximum concentrations to standards is typically conducted first, followed by the calculation of a statistically representative concentration and/or performance of statistical tests. If a maximum concentration is not accurate and no further statistical approach is taken, the comparison could lead to a project decision error. Part of the data validation process is to identify and assign qualifications to data that may not be accurate. The reason for the data qualification and its impact on the decision should be taken into consideration upon use of single estimated results. If the qualification indicates a high bias or the maximum is not qualified, but appears to be an outlier, the data can be tested according to an outlier test procedure (EPA 2006). Selection of the next-highest concentration may be appropriate depending on the data qualification or outlier test result. Justification for using a second-highest concentration should be provided if it becomes the basis of a project decision.

Statistical representations of the data such as the upper confidence limit on the mean (UCL) can be calculated and used for project decisions. The UCL (typically the 95 percent UCL) may be compared to a risk-based standard, but it should never be compared to the background upper tolerance limit (UTL). The UCL is a representation of central tendency, while the background UTL represents an upper percentile of the background distribution; any comparison between these parameters is biased. Before calculation of a UCL, it is important to evaluate the data distribution using goodness-of-fit tests to determine which distribution assumption is most appropriate. UCLs can be calculated according to a variety of procedures depending on the distribution assumption. It is often the case that data representing contaminated soil do not fit any distribution and are best represented by a non-parametric UCL. ProUCL or other software packages for testing goodness-of-fit and calculating the UCL for data sets with and without non-detect observations may be used (EPA 2009).

Soil data can be compared to background using statistical tests such as the Student's t-Test or Wilcoxon Rank Sum Test. These tests would be used to compare a data set representing onsite soil with a background distribution and determine whether the distributions are shifted relative to one another. A null hypothesis, alternative hypothesis, and decision errors must be specified in the sampling and analysis plan when these tests will be conducted. The hypothesis statement and decision errors for removal actions and confirmation sampling conducted previously in DOE Areas were:

H_o: Reference-based cleanup standard not achieved.

H_a: Reference-based cleanup standard achieved.

Type I decision error: 10 percent

Type II decision error: 20 percent

Where H_o is the null hypothesis, H_a is the alternative hypothesis and "Reference" is the background data set. If the Student's t-Test or other parametric statistical test is selected, goodness-of-fit needs to be tested for the onsite and background data to determine whether the parametric distribution assumption is appropriate. Contaminated soil data rarely pass goodness-of-fit tests, so non-parametric tests such as the Wilcoxon Rank Sum Test are recommended. Non-parametric tests, however, can be insensitive to high concentrations at the upper tail of the onsite distribution (hot spots). A graphical comparison of onsite data to reference data should be included in the evaluation to identify hot spots if a non-parametric test is used.

Other data quality issues include the use of outlier data and censored data. Point-to-point comparisons, parametric estimates, and parametric distribution tests are affected by outlier data. Non-parametric estimates and tests are much less sensitive when outlier data are used. Outlier data can lead to decision error in all cases. Statistical tests are available to determine whether a suspect result qualifies as an outlier (EPA 2006).

Censored data are typically not a problem for point-to-point comparisons, but statistical parameter calculations and distribution tests can yield wrong results if data are highly censored. When results are censored, the reporting limits should be compared to the requirements specified in Table A–2 and Table A–3. Censored data that do not meet the reporting limit requirements may still be usable for project decisions if comparison criteria are above the elevated detection limits. ProUCL has been updated to accommodate UCL calculations using censored data sets (EPA 2009). If data with elevated reporting limits cannot be used, the reason for the reporting limit failure should be determined. Sample matrix/chemistry can cause elevated reporting limits and can be impossible to control. For cases where reporting limits can be controlled, the data set will be evaluated for completeness and the affected samples will be re-analyzed or re-collected, if necessary, to meet the 90 percent completeness goal.

When the point-to-point data comparisons, parameter calculations, or distribution tests are performed, limitations shall be identified and their effect on the comparison or test result explained. The tolerable limits on decision errors shall be verified (see Type I and Type II decision errors discussed above). If a decision error exceeds the tolerable level, the error source shall be identified, if possible, and corrective actions determined, if any.

Table A–3. Required Detection Limits for Organic Constituents

Analyte	Required Detection Limit (µg/kg)	DOE Area
Volatile Organic Compounds		
2-Butanone	10	Ra/Sr, DSS 3, Dry Wells, SWT
Acetone	10	Ra/Sr, DSS 3, DSS 4
Ethylbenzene	10	Ra/Sr, DSS 4, Dry Wells, SWT
Isopropylbenzene	10	DSS 3
Methyl acetate	10	DSS 3
Methylene chloride	10	Ra/Sr, DSS 4
Styrene	10	DSS 3, DSS 4
Toluene	10	Ra/Sr, DSS 3, DSS 4, Dry Wells, SWT
Trichlorofluoromethane	10	DSS 3
Xylenes (total)	10	Ra/Sr, DSS 4, SWT
Semivolatile Organic Compounds		
1,3-Dichlorobenzene	330	DSS 3
1,4-Dichlorobenzene	330	DSS 3, DSS 4
2-Methylnaphthalene	330	DSS 3, DSS 4
Acenaphthene	330	DSS 4
Anthracene	330	DSS 4
Benzaldehyde	800	DSS 3
Benzo(a)anthracene	330	DSS 4
Benzo(a)pyrene	330	DSS 4
Benzo(b)fluoranthene	330	DSS 4
Benzo(ghi)perylene	330	DSS 4
Benzo(k)fluoranthene	330	DSS 4
bis(2-Ethylhexyl)phthalate	330	Ra/Sr, DSS 3, DSS 4
Butylbenzylphthalate	330	DSS 3, DSS 4
Carbazole	330	DSS 4
Chrysene	330	DSS 4
Dibenzo(a,h)anthracene	330	DSS 4
Dibenzofuran	330	DSS 4
Diethylphthalate	330	DSS 3
Di-n-butylphthalate	330	Ra/Sr, DSS 3
Di-n-octylphthalate	330	DSS 3
Fluoranthene	330	DSS 4
Fluorene	330	DSS 4
Hexachlorobenzene	330	DSS 3
Indeno(1,2,3-cd)pyrene	330	DSS 4
Naphthalene	330	DSS 4
Phenanthrene	330	DSS 4
Phenol	330	DSS 4
Pyrene	330	DSS 3, DSS 4
Pesticides/Polychlorinated Biphenyls		
alpha-Chlordane	1.7	Ra/Sr, DSS 3, DSS 4, Dry Wells, EDPs, SWT
gamma-Chlordane	1.7	Ra/Sr, DSS 3, DSS 4, Dry Wells, EDPs, SWT
Heptachlor	1.7	DSS 4, SWT
Heptachlor epoxide	1.7	DSS 4, SWT

Table A–3 (continued). Required Detection Limits for Organic Constituents

Analyte	Required Detection Limit (µg/kg)	DOE Area
4,4'-DDD	3.3	EDPs, SWT
4,4'-DDE	3.3	Ra/Sr, DSS 4, EDPs, SWT
4,4'-DDT	3.3	Ra/Sr, EDPs, SWT
Dieldrin	3.3	DSS 3, EDPs, SWT
Endrin	3.3	EDPs
Endrin aldehyde	3.3	DSS 3
Chlordane	3.3	Ra/Sr, DSS 4, EDPs
Aroclor-1254	33	DSS 3, EDPs

Abbreviations:

µg/kg = micrograms per kilogram
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
Ra/Sr = Radium/Strontium Treatment Systems
DSS 3 = Domestic Septic System 3
DSS 4 = Domestic Septic System 4
Dry Wells = Domestic Septic System Dry Wells A–E
EDPs = Eastern Dog Pens
SWT = Southwest Trenches

Suggestions for improved data collection and statistical evaluation will be provided, as appropriate, for the soil management project. The Project Chemist will identify the source of any failure to meet DQO performance/acceptance criteria and initiate corrective action, if necessary, to prevent future occurrences.

6.2.3 Excavated Soil Designation

Soil designations shall be reviewed and accepted by an environmental professional before the soil is disposed of. Sample data for soil excavated from the 0-to-10-foot below ground surface soil horizon can be compared to the site background levels provided in Table A–4 to determine the soil's designation. If the concentrations are below site background, the soil can be designated as clean and reused on site. If the contaminant concentrations in soil exceed the background levels listed in the table, an additional comparison to background data distributions, using a statistical test, may be conducted. By definition, 5 percent of uncontaminated soil is statistically expected to contain constituent concentrations above the background levels listed in Table A–4. These background levels are estimates of the 95th percentile of the sample distribution for site soil representative of background conditions. Thus, a soil stockpile may not contain contamination even though some results are above the background levels. Statistical tests such as the Wilcoxon Rank Sum test (Gilbert 1987) can be used to compare excavated soil data to the background data, and can more accurately determine whether excavated soil is contaminated. Additional sample collection may be necessary to meet the statistical power requirement of the test. Statistical tests generally require at least five samples.

Table A–4. Background Values for Metals and Radionuclides Potentially Present in Soil at DOE Areas

Constituent	Shallow[a] Background (mg/kg or pCi/g)	Subsurface[b] Background (mg/kg or pCi/g)	Combined Depths Background (mg/kg or pCi/g)
Metals			
Antimony	NA	NA	1.4
Arsenic	8.14	10.9	NA
Barium	211	294	NA
Beryllium	0.564	0.924	NA
Cadmium	NA	NA	0.51
Chromium	199	125	NA
Cobalt	NA	NA	31
Copper	48.8	61.8	NA
Iron	NA	NA	44,000
Lead	NA	NA	9.5
Manganese	NA	NA	750
Mercury	3.94	0.248	NA
Molybdenum	NA	NA	<0.26
Nickel	334	246	NA
Selenium	NA	NA	1.2
Silver	NA	NA	0.55
Thallium	NA	NA	1.6
Vanadium	66.8	80.3	NA
Zinc	72.4	93.1	NA
Radionuclides			
Actinium-228	0.633	0.642	NA
Americium-241	NA	NA	<0.014
Bismuth-212	0.388	0.434	NA
Bismuth-214	NA	NA	0.54
Carbon-14	NA	NA	<0.13
Cesium-137	0.102	0.00695	NA
Cobalt-60	NA	NA	<0.006
Lead-210	NA	NA	1.6
Lead-212	0.691	0.684	NA
Lead-214	0.55	0.581	NA
Plutonium-241	NA	NA	<0.5
Potassium-40	NA	NA	14
Radium-226	NA	NA	0.752
Radium-228	0.63	0.655	NA
Strontium-90	NA	NA	0.056
Thallium-208	0.204	0.223	NA
Thorium-228	0.627	0.771	NA
Thorium-230	NA	NA	1.04
Thorium-232	0.63	0.8	NA
Thorium-234	NA	NA	0.78
Tritium	NA	NA	<1.2
Uranium-234	0.559	0.706	NA
Uranium-235	NA	NA	0.038
Uranium-238	0.565	0.645	NA

Table A–4 (continued). Background Values for Metals and Radionuclides Potentially Present in Soil at DOE Areas

Constituent	Shallow[a] Background (mg/kg or pCi/g)	Subsurface[b] Background (mg/kg or pCi/g)	Combined Depths Background (mg/kg or pCi/g)
General Chemistry			
Hexavalent Chromium	NA	NA	1.3
Nitrate	NA	NA	36

Notes:
[a] Shallow soil background is representative of soil in the 0-to-4-foot depth interval.
[b] Subsurface soil background is representative of soil deeper than 4 feet below ground surface and less than or equal to approximately 40 feet below ground surface.

Abbreviations:
mg/kg = Milligrams per kilogram
pCi/g = Picocuries per gram
NA = Not applicable
<n = Not detected in background; detection limit of *n*

Other approaches to designating soils as clean or contaminated may be used as long as regulatory approval is obtained for such approaches.

6.3 Waste Disposal

Analytical data and process knowledge shall be used to certify and designate waste as clean, nonhazardous, hazardous, or radioactive, in accordance with applicable federal and State requirements. A designation report containing the technical basis for waste classification in accordance with all applicable regulatory requirements shall be completed to document the designation decision. The report shall be reviewed and accepted by an environmental professional and submitted to the EH&S Unit for review and approval.

All off-site disposal of waste soil will be in a landfill that complies with the Off-Site Rule of Section 121(d)(3) of CERCLA (40 CFR 300.440). The landfill may require specific analytical testing to document that chemical concentrations do not exceed their waste acceptance criteria.

6.3.1 Clean Soil

Clean excavated soil will be reused on site (such as for fill or other construction purposes), to the extent practicable. If on-site reuse is not practical or cost-effective, clean waste soil will be disposed of in a qualifying landfill (see Section 6.3 above).

6.3.2 Nonhazardous Soil

Excavated soil classified as nonhazardous will be disposed of in a Class II or other acceptable landfill, depending on the acceptance criteria of the landfill. Such soil may not have any added radioactivity (i.e., above activities found in background soils). The landfill may require analytical testing of the soil to document that chemical concentrations do not exceed their waste acceptance criteria.

Nonhazardous soil may also be reused on site if a risk assessment can demonstrate that reusing the soil does not pose a risk to human health, the environment, or water quality. At a minimum, the risk assessment must address human health, ecological receptors, groundwater quality, surface water, and the proposed soil reuse scenario (e.g., surface soil layer, subsurface soil layer covered with clean import fill). The risk assessment must be prepared by a qualified professional and evaluate risks of on-site reuse of contaminated soil, taking into account the appropriate site use. A tiered approach should be applied in conducting the risk assessment taking into account the contaminant concentrations, applicable standards, reuse scenarios, volumes of soil to be reused, and other applicable factors. The initial tier of this assessment shall consist of a comparison of the concentrations of chemical and radiological constituents in the soil to applicable risk-based standards (e.g., EPA Region 9 risk-based screening levels [RSLs] or equivalent). DOE, DTSC, and EPA shall approve the risk assessment before the soil may be reused. The soil must be reused in accordance with the risk assessment assumptions.

6.3.3 Hazardous, Radioactive, or Mixed Waste Soil

Soil classified as hazardous and/or containing added radioactivity that fails the risk assessment for reuse on site may be treated on site or be shipped off site for disposal at a facility permitted to accept such soil. Soil removed from the DOE areas subject to this SMP is not expected to be mixed waste or hazardous waste.

On-site treatment shall be conducted only with agency approval and must meet the requirements of the Site Treatment Plan and all applicable laws. On-site treatment may be performed to reduce waste toxicity or consolidate volume prior to disposal. If contaminated soil is disposed of at an off-site location, it will be handled in accordance with the Resource Conservation and Recovery Act, California hazardous waste laws and regulations, and other applicable laws.

A waste profile, containing all associated analytical data and radiological survey data, must be developed for the soil or excavated waste to be shipped off site for disposal. The profile shall compare waste characterization data to the disposal facility waste acceptance criteria to determine if the acceptance criteria are met.

Radioactive or mixed waste soil will be disposed of in facilities licensed to accept low-level radioactive and mixed wastes, respectively. DOE must approve the disposal before the material is moved off site.

Soil with added radioactivity may also be reused on site if a risk assessment can demonstrate that reusing the soil does not pose a risk to human health, the environment, or water quality. At a minimum, the risk assessment must address human health, ecological receptors, groundwater quality, and surface water for the proposed soil reuse scenario (e.g., surface soil layer, subsurface soil layer covered with clean import fill). DOE, DTSC, and EPA shall approve the risk assessment before the soil may be reused. All signatories to the ROD will be provided the opportunity to review and comment on the risk assessment. The soil must be reused in accordance with the risk assessment assumptions.

7.0 Inspections

As frequently as appropriate for the work being performed, the EH&S Unit shall inspect active excavation, digging, or other soil-disturbing activities authorized by the EH&S Unit to ensure that they comply with this SMP. Stop-work orders shall be promptly issued if any noncompliance has occurred. An investigation shall be conducted to determine the cause of, and parties responsible for, any noncompliance before work activities resume.

DOE and all signatories to the ROD shall be promptly notified of the findings of the investigation if the occurrence put human health or the environment at risk.

Evidence of unauthorized soil disturbance shall be documented and reported to DOE, DTSC, and EPA within 30 days of its identification. Corrective action, if required, shall be developed in coordination with DOE, DTSC, EPA, other signatories to the ROD as appropriate, and the EH&S Unit.

8.0 Documentation

8.1 Recordkeeping

The following documentation must be maintained and submitted to the EH&S Unit for all soil-disturbing projects:

- Work Plans
- Analytical data
- Soil designation reports
- Hazardous waste manifests
- Manifest fee documents
- Bills of Lading for Disposal

8.2 Soil Disturbance Reports

A soil disturbance report shall be submitted to the EH&S Unit at the completion of soil-disturbing activities. At a minimum, the report shall include:

- A description of work performed;
- A map, with the project location and location(s) of soil disturbance, soil removal, soil reuse, and/or placement of imported soil;
- A map of waste storage and stockpile locations;
- A map of sampling locations, as appropriate;
- Contaminants of concern;
- EPA analytical methods;
- Analytical data results, including associated laboratory quality control reports;

- A risk assessment with a recommended course of action;
- Waste characterization data;
- Waste profiles and manifests for soil disposed of at off-site disposal facilities;
- Volumes of soil reused on site along with surveyed coordinates indicating the location(s) where such soil was placed; and
- Analytical data for an imported soil placed on site.

8.3 Annual Reports

Per the requirements of the ROD and as described in the RD/RAWP, DOE shall submit a written land-use covenant report to all ROD signatories annually. Reports shall be submitted within 30 days of the anniversary date of the ROD signature date and shall include:

- Inspection results;
- A certification attesting to compliance with the terms and conditions of the land-use covenant; and
- A discussion of any soil-disturbing activities and the final disposal of any wastes generated, any violations of the land-use covenant, and any action taken to ensure compliance with the land-use covenant.

These reports shall discuss SMP implementation and summarize the data and information described in Sections 8.1 and 8.2 above.

8.4 Audits

DOE shall audit the implementation of this SMP as needed but no less frequently than every 5 years. The audit shall review:

- Compliance with this SMP,
- Safety documentation,
- Soil reuse approvals,
- Waste disposal records, and
- Incidents and corrective actions.

The results of the audits shall be included in 5-year reviews.

8.5 5-Year Reviews

Sites that have remaining hazardous substances, pollutants, or contaminants above levels that allow for unlimited use and unrestricted exposure after remedial actions must be reviewed every 5 years to ensure protection of human health and the environment. DOE will conduct a 5-year review in accordance with the requirement provided in the RD/RAWP, as well as any regulations, policies, and guidance applicable at the time. Any recommended SMP modification will be addressed during these reviews.

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Attachment A

Tables of Contaminants Detected at Concentrations Above Site Background (0−10 Feet Below Ground Surface)

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Attachment A Table 1. Contaminants Detected at Concentrations Above Background in the Radium/Strontium Treatment Systems Area, 0 to 10 Feet Below Ground Surface

Constituent	Samples	Detections	Detections Above Background	Sample ID Number of Maximum Concentration	Concentration Range	Detection Limit Range	Surface/Subsurface Soil Background[a]	Units	Depth of Maximum (feet)
2-Butanone	78	25	25	SSRSC005	1.4–132	5.1–53	0	µg/kg	10
4,4'-DDE	78	5	5	SSRSC021	0.34–3.2	3.6–193	0	µg/kg	2
4,4'-DDT	78	14	14	SSRSC066	0.39–133	3.6–193	0	µg/kg	3
Acetone	78	10	10	SSRSC036	2.88–36.3	5.3–52.6	0	µg/kg	10
Alpha-Chlordane	78	32	32	SSRSC066	0.39–277	1.8–96.6	0	µg/kg	3
Americium-241	84	22	3	SSRSC053	0.00243–0.0847	0.00114–0.031	0.014	pCi/g	8
Barium	78	78	3	SSRSC075	84.7–317	0.018–44.6	211 / 294	mg/kg	6
Bis(2-ethylhexyl)phthalate	83	27	27	SSRSC022	21.6–198	344–6940	0	µg/kg	5
Cadmium	78	26	5	SSRSC072	0.095–1.4	0.034–1.1	0.51	mg/kg	6
Carbon-14	85	16	5	SSRSC019	0.0707–2.38	0.0641–0.104	0.13	pCi/g	8
Chlordane	18	15	15	CWRSC036	4–28	172–687	0	µg/kg	3
Copper	78	78	7	SSRSC072	19.9–182	0.15–5.6	48.8 / 61.8	mg/kg	6
Di-n-butylphthalate	83	13	13	SSRSC065	8.8–380	344–6940	0	µg/kg	1.5
Ethylbenzene	78	21	21	SSRSB010	0.55–1.6	1–12.7	0	µg/kg	1
gamma-Chlordane	78	32	32	SSRSC066	0.65–346	1.8–96.6	0	µg/kg	3
Hexavalent Chromium	79	60	0	SSRSC070	0.0624–0.841	0.036–0.541	1.3	mg/kg	7
Iron	60	60	1	SSRSC075	16500–45400	0.47–22.3	44000	mg/kg	6
Methylene chloride	78	70	70	SSRSC072	0.53–7.04	5.1–53	0	µg/kg	6
Plutonium-241	84	10	5	SSRSC073	0.335–1.32	0.286–0.539	0.5	pCi/g	6
Selenium	78	70	26	SSRSB009	0.52–2.1	0.27–1.1	1.2	mg/kg	1
Silver	77	43	22	CWRSC046	0.14–4.6	0.085–2.2	0.55	mg/kg	3
Strontium-90	89	41	25	SSRSC043	0.0151–2.18	0.0124–0.22	0.056	pCi/g	5
Thallium	78	4	2	SSRSB010	1.2–1.9	0.37–2.2	1.6	mg/kg	1
Thorium-228	84	84	13	SSRSC076	0.314–1.12	0.045–0.674	0.627 / 0.771	pCi/g	2
Toluene	78	68	68	SSRSC059	0.625–263	1–56.2	0	µg/kg	10
Vanadium	78	78	12	SSRSC075	30.3–84.9	0.0728–11.2	66.8 / 80.3	mg/kg	6
Xylenes (total)	78	37	37	SSRSB010	0.678–9.4	3.1–38	0	µg/kg	1
Zinc	78	78	20	SSRSC072	36.4–151	0.053–4.5	72.4 / 93.1	mg/kg	6

Attachment A Table 1 (continued). Contaminants Detected at Concentrations Above Background in the Radium/Strontium Treatment Systems Area, 0 to 10 Feet Below Ground Surface

Notes:
Concentrations reflect post-removal-action conditions.
Includes inorganic constituents with statistical test results indicating above-background concentrations in soil from 0 to 10 feet below ground surface (UC Davis 2004).
Includes organic constituents with detection frequency of 5 percent or more in soil from 0 to 10 feet below ground surface (SWRA Table 2 [UC Davis 2004]).
Copy of soil data provided in Attachment C.
[a] Background values for surface soil (0 to 4 feet below ground surface) and subsurface soil (greater than 4 feet below ground surface) provided for constituents with statistically significant vertical stratification (Weiss 2000). Single background value provided for non-stratified constituents.

Abbreviations:
µg/kg = micrograms per kilogram
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
mg/kg = milligrams per kilogram
pCi/g = picocuries per gram
SWRA = Site-Wide Risk Assessment

Attachment A Table 2. Contaminants Detected at Concentrations Above Background in the Domestic Septic System 3, 0 to 10 Feet Below Ground Surface

Constituent	Samples	Detections	Detections Above Background	Sample ID Number of Maximum Concentration	Concentration Range	Detection Limit Range	Surface/Subsurface Soil Background[a]	Units	Depth of Maximum (feet)
1,3-Dichlorobenzene	10	1	1	SSIBF155	0.286–0.286	9.6–367	0	µg/kg	6.5
1,4-Dichlorobenzene	10	2	2	CSD3C001	0.579–0.819	9.6–367	0	µg/kg	9
2-Butanone	10	2	2	LEHR-S-T304	2.55–4	9.6–12	0	µg/kg	8
2-Methylnaphthalene	10	7	7	SSD3C024	0.34–0.8	333–709	0	µg/kg	8
Acetone	10	3	3	CSD3C001	6.46–30.9	9.6–12	0	µg/kg	9
alpha-Chlordane	26	18	18	SSD3C047DL	0.063–161	1.7–38.2	0	µg/kg	5.9
Aroclor-1254	7	2	2	SSD3C024	21.7–225	33.3–69.4	0	µg/kg	8
Benzaldehyde	8	2	2	SSD3C024	15.6–53.8	333–709	0	µg/kg	8
bis(2-Ethylhexyl)phthalate	10	10	10	SSD3C036	11.5–101	333–709	0	µg/kg	5.5
Butylbenzylphthalate	10	3	3	SSD3C030	0.59–5.5	333–709	0	µg/kg	7
Cesium-137	31	7	5	LEHR-S-T301	0.0049–0.126	0.00209–0.053	0.102 / 0.00695	pCi/g	8
Dieldrin	7	1	1	SSIBF156	2.4–2.4	3.3–19.8	0	µg/kg	4.5
Diethylphthalate	10	4	4	SSD3C030	0.6–1.2	333–709	0	µg/kg	7
Di-n-butylphthalate	10	7	7	SSD3C036	2.9–20.6	333–709	0	µg/kg	5.5
Di-n-octylphthalate	10	1	1	SSIBF155	0.49–0.49	333–709	0	µg/kg	6.5
Endrin aldehyde	7	1	1	SSIBF156	0.35–0.35	3.3–6.9	0	µg/kg	4.5
Formaldehyde	20	19	19	SSD3C041	0.21–1.3	0.1–0.11	0	mg/kg	5.9
gamma-Chlordane	26	20	20	SSD3C047DL	0.13–294	1.7–38.2	0	µg/kg	5.9
Hexachlorobenzene	10	1	1	SSD3C024	125–125	333–709	0	µg/kg	8
Isopropylbenzene	8	1	1	SSIBF155	1.47–1.47	9.6–11.8	0	µg/kg	6.5
Lead-210	31	10	1	LEHR-S-T301	0.48–4.4	0.0691–1.76	1.6	pCi/g	8
Methyl acetate	8	1	1	SSD3C028	3.4–3.4	9.6–11.8	0	µg/kg	6
Pyrene	10	2	2	SSD3C025	0.81–3.3	333–709	0	µg/kg	8
Strontium-90	25	15	12	SSD3C062	0.0281–0.591	0.0154–0.0661	0.056	pCi/g	5.2
Styrene	10	1	1	SSIBF155	0.326–0.326	9.6–12	0	µg/kg	6.5
Thallium	10	3	2	CSD3C001	1.1–2.8	0.87–5.1	1.6	mg/kg	9
Toluene	10	7	7	SSD3C019	0.638–74.7	9.6–12	0	µg/kg	10
Trichlorofluoromethane	8	1	1	SSIBF155	1.18–1.18	9.6–11.8	0	µg/kg	6.5
Zinc	10	10	1	LEHR-S-T301	37.9–258	0.1–4.3	72.4 / 93.1	mg/kg	8

Attachment A Table 2 (continued). Contaminants Detected at Concentrations Above Background in the Domestic Septic System 3, 0 to 10 Feet Below Ground Surface

Notes:
Concentrations reflect post-removal-action conditions.
Includes inorganic constituents with statistical test results indicating above-background concentrations in soil from 0 to 10 feet below ground surface (UC Davis 2004).
Includes organic constituents with detection frequency of 5 percent or more in soil from 0 to 10 feet below ground surface (SWRA Table 2 [UC Davis 2004]).
Copy of soil data provided in Attachment C.
[a]Background values for surface soil (0 to 4 feet below ground surface) and subsurface soil (greater than 4 feet below ground surface) provided for constituents with statistically significant vertical stratification (Weiss 2000). Single background value provided for non-stratified constituents.

Abbreviations:
µg/kg micrograms per kilogram
mg/kg milligrams per kilogram
pCi/g picocuries per gram
SWRA Site-Wide Risk Assessment

Attachment A Table 3. Contaminants Detected at Concentrations Above Background in the Domestic Septic System 4, 0 to 10 Feet Below Ground Surface

Constituent	Samples	Detections	Detections Above Background	Sample ID Number of Maximum Concentration	Concentration Range	Detection Limit Range	Surface/Subsurface Soil Background[a]	Units	Depth of Maximum (feet)
1,4-Dichlorobenzene	6	2	2	SSD4C003A/B	3.2–4.1	350–360	0	µg/kg	4.2
2-Methylnaphthalene	6	2	2	SSD4C003A/B	8.8–56.7	350–360	0	µg/kg	4.2
4,4'-DDE	5	1	1	SSD4C005	8.1–8.1	3.5–35.8	0	µg/kg	4.2
Acenaphthene	6	2	2	SSD4C003A/B	71.4–342	350–360	0	µg/kg	4.2
Acetone	6	3	3	LEHR-S-T405	2.05–23	10.5–26.4	0	µg/kg	8.5
Alpha-Chlordane	5	2	2	SSD4C003A/B	16.7–179	1.8–18.3	0	µg/kg	4.2
Anthracene	6	3	3	SSD4C003A/B	11.7–1160	350–360	0	µg/kg	4.2
Benzo(a)anthracene	6	3	3	SSD4C003A/B	50.3–3760	350–360	0	µg/kg	4.2
Benzo(a)pyrene	6	3	3	SSD4C003A/B	38.8–2380	350–360	0	µg/kg	4.2
Benzo(b)fluoranthene	6	3	3	SSD4C002A/B	35.7–2700	350–360	0	µg/kg	4.2
Benzo(ghi)perylene	6	3	3	SSD4C002A/B	26.4–1750	350–360	0	µg/kg	4.2
Benzo(k)fluoranthene	6	3	3	SSD4C003A/B	40–1530	350–360	0	µg/kg	4.2
Bis(2-Ethylhexyl)phthalate	6	6	6	SSD4C001	36.2–440	350–360	0	µg/kg	7.8
Butylbenzylphthalate	6	1	1	SSD4C002A/B	13.1–13.1	350–360	0	µg/kg	4.2
Carbazole	6	2	2	SSD4C003A/B	88.8–486	350–360	0	µg/kg	4.2
Chlordane	1	1	1	SSD4C005	181–181	89.6–89.6	0	µg/kg	4.2
Chromium	6	6	6	LEHR-S-T402	159–319	0.061–2.1	199 / 125	mg/kg	8
Chrysene	6	3	3	SSD4C003A/B	53.7–3010	350–360	0	µg/kg	4.2
Dibenzo(a,h)anthracene	6	2	2	SSD4C002A/B	9.1–1080	350–360	0	µg/kg	4.2
Dibenzofuran	6	2	2	SSD4C003A/B	33.2–187	350–360	0	µg/kg	4.2
Ethylbenzene	6	1	1	SSD4C004	0.882–0.882	1–12	0	µg/kg	7.75
Fluoranthene	6	3	3	SSD4C003A/B	80–2900	350–360	0	µg/kg	4.2
Fluorene	6	3	3	SSD4C003A/B	3.6–507	350–360	0	µg/kg	4.2
gamma-Chlordane	5	3	3	SSD4C003A/B	1–275	1.8–18.3	0	µg/kg	4.2
Heptachlor	5	1	1	SSD4C003A/B	5.8–5.8	1.8–18.3	0	µg/kg	4.2
Heptachlor Epoxide	5	1	1	SSD4C003A/B	10.7–10.7	1.8–18.3	0	µg/kg	4.2
Indeno(1,2,3-cd)pyrene	6	2	2	SSD4C003A/B	431–1470	350–360	0	µg/kg	4.2
Lead-210	6	3	1	LEHR-S-T401	0.434–4.7	0.0352–1.3	1.6	pCi/g	5.5
Methylene Chloride	6	4	4	SSD4C003A/BDL	2.89–457	5.3–53.8	0	µg/kg	4.2
Naphthalene	6	2	2	SSD4C003A/B	13.3–70.5	350–360	0	µg/kg	4.2

Attachment A Table 3 (continued). Contaminants Detected at Concentrations Above Background in the Domestic Septic System 4, 0 to 10 Feet Below Ground Surface

Constituent	Samples	Detections	Detections Above Background	Sample ID Number of Maximum Concentration	Concentration Range	Detection Limit Range	Surface/Subsurface Soil Background[a]	Units	Depth of Maximum (feet)
Phenanthrene	6	3	3	SSD4C003A/B	37.4–2880	350–360	0	µg/kg	4.2
Pyrene	6	3	3	SSD4C003A/B	75.3–5110	350–360	0	µg/kg	4.2
Selenium	6	2	2	SSD4C003A/B	1.23–2	0.376–0.74	1.2	mg/kg	4.2
Strontium-90	6	0	0	NA	NA	0.028–0.47	0.056	pCi/g	NA
Styrene	6	1	1	SSD4C004	0.673–0.673	1–12	0	µg/kg	7.75
Toluene	6	3	3	SSD4C001DL	1.52–197	1–52.9	0	µg/kg	7.8
Xylenes (Total)	6	2	2	SSD4C004	1.02–5.6	2.1–32.3	0	µg/kg	7.75

Notes:
Concentrations reflect current conditions. No removal actions have been conducted.
Includes inorganic constituents with statistical test results indicating above-background concentrations in soil from 0 to 10 feet below ground surface (UC Davis 2004).
Includes organic constituents with detection frequency of 5 percent or more in soil from 0 to 10 feet below ground surface. SWRA Table 2 (UC Davis 2004).
Copy of soil data provided in Attachment C.
[a]Background values for surface soil (0 to 4 feet below ground surface) and subsurface soil (greater than 4 feet below ground surface) provided for constituents with statistically significant vertical stratification (Weiss 2000). Single background value provided for non-stratified constituents.

Abbreviations:
µg/kg = micrograms per kilogram
DDE = dichlorodiphenyldichloroethylene
mg/kg = milligrams per kilogram
NA = not applicable
pCi/g = picocuries per gram
SWRA = Site-Wide Risk Assessment

Attachment A Table 4. Contaminants Detected at Concentrations Above Background in the Dry Wells A–E Area, 0 to 10 Feet Below Ground Surface

Constituent	Samples	Detections	Detections Above Background	Sample ID Number of Maximum Concentration	Concentration Range	Detection Limit Range	Surface/Subsurface Soil Background[a]	Units	Depth of Maximum (feet)
2-Butanone	9	5	5	SSSTC011	7–70	11.4–20	0	µg/kg	5
Alpha-Chlordane	9	4	4	SSSTC008	0.77–6.2	1.9–2.2	0	µg/kg	8
Arsenic	13	13	0	SSSTC006	5.9–10.8	0.56–2.4	8.14 / 10.9	mg/kg	5
Barium	13	13	0	SSDWC022	148–253	0.053–49.2	211 / 294	mg/kg	10
Beryllium	13	13	0	SSDWC023	0.31–0.58	0.046–1.2	0.564 / 0.924	mg/kg	10
Carbon-14	10	1	0	SSSTC006	0.0915–0.0915	0.0768–0.53	0.13	pCi/g	5
Cobalt-60	10	0	0	NA	NA	0.00499–0.051	0.006	pCi/g	NA
Copper	13	13	0	SSDWC023	30.5–52.4	0.22–6.1	48.8 / 61.8	mg/kg	10
Ethylbenzene	9	4	4	SSSTC011	0.749–2.24	5–12.6	0	µg/kg	5
Gamma-Chlordane	9	4	4	SSSTC008	0.76–6.7	1.9–2.2	0	µg/kg	8
Iron	13	13	0	SSSTC006	30200–40300	0.48–24.6	44000	mg/kg	5
Radium-226	10	10	0	SSSTC005	0.43–0.675	0.0298–0.3	0.752	pCi/g	6
Selenium	13	5	1	SSDWC027	0.79–1.7	0.58–1.2	1.2	mg/kg	10
Silver	13	9	7	SSDWC027	0.47–27.6	0.14–2.4	0.55	mg/kg	10
Strontium-90	10	4	3	SSSTC006	0.0521–0.153	0.0355–0.51	0.056	pCi/g	5
Thorium-228	7	7	0	SSSTC006	0.604–0.771	0.162–0.408	0.627 / 0.771	pCi/g	5
Thorium-232	7	7	1	SSSTC006	0.325–0.875	0.0303–0.153	0.63 / 0.8	pCi/g	5
Thorium-234	10	7	1	SSSTC005	0.502–0.899	0.0908–1.5	0.78	pCi/g	6
Toluene	9	6	6	SSSTC008	1.47–214	5–24.4	0	µg/kg	8
Uranium-233/234	7	7	0	SSSTC006	0.486–0.57	0.00231–0.012	0.559 / 0.706	pCi/g	5
Uranium-238	7	7	0	SSSTC006	0.461–0.599	0.00231–0.0103	0.565 / 0.645	pCi/g	5
Vanadium	13	13	1	SSDWC023	56.8–82.9	0.1–12.3	66.8 / 80.3	mg/kg	10
Zinc	13	13	1	LEHR-S-T1A01(5.0)	70.3–136	0.11–4.9	72.4 / 93.1	mg/kg	5

Attachment A Table 4 (continued). Contaminants Detected at Concentrations Above Background in the Dry Wells A–E Area, 0 to 10 Feet Below Ground Surface

Notes:
Concentrations reflect post-removal-action conditions.
Includes inorganic constituents with statistical test results indicating above-background concentrations in soil from 0 to 10 feet below ground surface (UC Davis 2004).
Includes organic constituents with detection frequency of 5 percent or more in soil from 0 to 10 feet below ground surface. SWRA Table 2 (UC Davis 2004).
Copy of soil data provided in Attachment C.
[a]Background values for surface soil (0 to 4 feet below ground surface) and subsurface soil (greater than 4 feet below ground surface) provided for constituents with statistically significant vertical stratification (Weiss 2000). Single background value provided for non-stratified constituents.

Abbreviations:

µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
NA	not applicable
pCi/g	picocuries per gram
SWRA	Site-Wide Risk Assessment

Attachment A Table 5. Contaminants Detected at Concentrations Above Background in the Southwest Trenches Area, 0 to 10 Feet Below Ground Surface

Constituent	Samples	Detections	Detections Above Background	Sample ID Number of Maximum Concentration	Concentration Range	Detection Limit Range	Surface/Subsurface Soil Background[a]	Units	Depth of Maximum (feet)
2-Butanone	66	8	8	SSDTC049	3.92–548	10–56.2	0	µg/kg	4
4,4'-DDD	80	36	36	LEHR-S-486	0.033–99	0.73–360	0	µg/kg	3
4,4'-DDE	80	29	29	SSDTC062	0.065–26.8	0.73–35.1	0	µg/kg	4
4,4'-DDT	80	35	35	SSDTC041DL1	2.2–276	0.73–36.5	0	µg/kg	6
Alpha-Chlordane	98	71	71	LEHR-S-484	0.032–1700	0.36–180	0	µg/kg	3.5
Americium-241	51	4	2	SSDTC025	0.00431–0.0378	0.00288–0.027	0.014	pCi/g	3
Antimony	66	31	1	SSDTC069	0.28–1.5	0.49–14	1.4	mg/kg	4
Barium	66	66	1	SSDTC087	111–286	9.7–46.6	211 / 294	mg/kg	10
Carbon-14	68	28	26	SSDTC024	0.111–5.84	0.0899–11	0.13	pCi/g	3
Cesium-137	97	14	4	SSDTC036	0.0219–1.18	0.00542–0.054	0.102 / 0.00695	pCi/g	6
Cobalt-60	95	0	0	NA	NA	0.0139–0.062	0.006	pCi/g	NA
Dieldrin	80	6	6	LEHR-S-484	0.41–70	0.73–35.1	0	µg/kg	3.5
Ethylbenzene	66	13	13	SSDTC048	0.577–2.87	1.1–56.2	0	µg/kg	6
Formaldehyde	14	1	1	LEHR-S-482	1.4–1.4	1–1	0	mg/kg	3
gamma-Chlordane	98	73	73	LEHR-S-484	0.12–1900	0.36–180	0	µg/kg	3.5
Heptachlor	80	22	22	LEHR-S-486	0.2–96	0.36–17.5	0	µg/kg	3
Heptachlor Epoxide	80	9	9	SSDTC004	0.87–3.8	0.36–17.5	0	µg/kg	3
Hexavalent Chromium	95	77	0	SSDTC052	0.0474–1.06	0.182–0.5	1.3	mg/kg	4
Iron	66	66	1	SSDTC067	21000–44200	19.5–220	44000	mg/kg	8
Lead-210	95	11	2	SSDTF370	0.261–7.17	0.194–8.89	1.6	pCi/g	1.5
Plutonium-241	52	6	1	SSDTC020	0.338–0.517	0.268–0.478	0.5	pCi/g	3
Selenium	66	17	2	SSDTC090	0.58–1.4	0.47–1.1	1.2	mg/kg	0
Silver	66	8	2	SSDTC052	0.4–0.75	0.4–2.3	0.55	mg/kg	4
Strontium-90	94	24	23	SSDTC066	0.0498–2.62	0.0236–0.5	0.056	pCi/g	7
Thorium-228	52	52	5	SSDTC076	0.336–0.894	0.0544–0.387	0.627 / 0.771	pCi/g	5
Toluene	66	33	33	SSDTC056	0.723–438	1.1–56.2	0	µg/kg	5
Tritium	53	9	8	SSDTC065	0.971–2.93	0.721–1.18	1.2	pCi/g	10
Vanadium	66	66	5	SSDTC079	41–83.9	0.97–11.6	66.8 / 80.3	mg/kg	8
Xylenes (Total)	80	39	39	SSDTC075R	0.534–16.4	1.1–56.2	0	µg/kg	3
Zinc	66	66	6	SSDTC020	48.6–150	3.9–4.6	72.4 / 93.1	mg/kg	3

Attachment A Table 5 (continued). Contaminants Detected at Concentrations Above Background in the Southwest Trenches Area, 0 to 10 Feet Below Ground Surface

Notes:
Concentrations reflect post-removal-action conditions.
Includes inorganic constituents with statistical test results indicating above-background concentrations in soil from 0 to 10 feet below ground surface (UC Davis 2004).
Includes organic constituents with detection frequency of 5 percent or more in soil from 0 to 10 feet below ground surface. SWRA Table 2 (UC Davis 2004).
Copy of soil data provided in Attachment C.
[a] Background values for surface soil (0 to 4 feet below ground surface) and subsurface soil (greater than 4 feet below ground surface) provided for constituents with statistically significant vertical stratification (Weiss 2000). Single background value provided for non-stratified constituents.

Abbreviations:
µg/kg = micrograms per kilogram
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
mg/kg = milligrams per kilogram
NA = not applicable
pCi/g = picocuries per gram
SWRA = Site-Wide Risk Assessment

Attachment A Table 6. Contaminants Detected at Concentrations Above Background in the Eastern Dog Pens Area

Constituent	Samples	Detections	Detections Above Background	Sample ID Number of Maximum Concentration	Concentration Range	Detection Limit Range	Surface/Subsurface Soil Background[a]	Units	Depth of Maximum (feet)
4,4'-DDD	36	7	7	SSDP0343	0.82–3.3	3.4–4.2	0	µg/kg	1.02
4,4'-DDE	36	3	3	SSDP0330	0.3–3.6	3.4–4.2	0	µg/kg	2.01
4,4'-DDT	36	5	5	SSDP0318	0.48–5.8	3.4–4.2	0	µg/kg	1.17
Alpha-Chlordane	36	12	12	SSDP0346DL1	0.38–47.8	1.7–3.7	0	µg/kg	0.02
Aroclor-1254	37	2	2	SSDP0319	24.3–54.9	34–42.2	0	µg/kg	1.17
Chromium	37	37	3	SSDP0336	90.7–251	2–2.4	199 / 125	mg/kg	0.96
Cobalt-60	37	0	0	NA	NA	0.00463–0.00773	0.006	pCi/g	NA
Dieldrin	37	13	13	SSDP0338DL1	0.76–223	3.4–18.1	0	µg/kg	0
gamma-Chlordane	36	12	12	SSDP0346DL1	0.4–43.4	1.7–3.7	0	µg/kg	0.02
Hexavalent Chromium	37	36	0	SSDP0320	0.077–0.673	0.204–0.254	1.3	mg/kg	3.17
Lead-210	37	10	0	SSDP0334	0.356–1.33	0.0656–2.09	1.6	pCi/g	0.41
Strontium-90	53	14	7	GSDP0004	0.023–0.201	0.0143–0.0493	0.056	pCi/g	1.5
Tritium	42	0	0	NA	NA	0.874–1.18	1.2	pCi/g	NA

Notes:
Concentrations reflects current conditions after completion of a maintenance action to remove all concrete materials from the area.
Includes inorganic constituents with statistical test results indicating above-background concentrations in soil from 0 to 10 feet below ground surface (UC Davis 2004).
Includes organic constituents with detection frequency of 5 percent or more in soil from 0 to 10 feet below ground surface. SWRA Table 2 (UC Davis 2004).
Copy of soil data provided in Attachment C.
[a] Background values for surface soil (0 to 4 feet below ground surface) and subsurface soil (greater than 4 feet below ground surface) provided for constituents with statistically significant vertical stratification (Weiss 2000). Single background value provided for non-stratified constituents.

Abbreviations:
µg/kg = micrograms per kilogram
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
mg/kg = milligrams per kilogram
NA = not applicable
pCi/g = picocuries per gram
SWRA = Site-Wide Risk Assessment

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Attachment B

Soil Sample Location Figures

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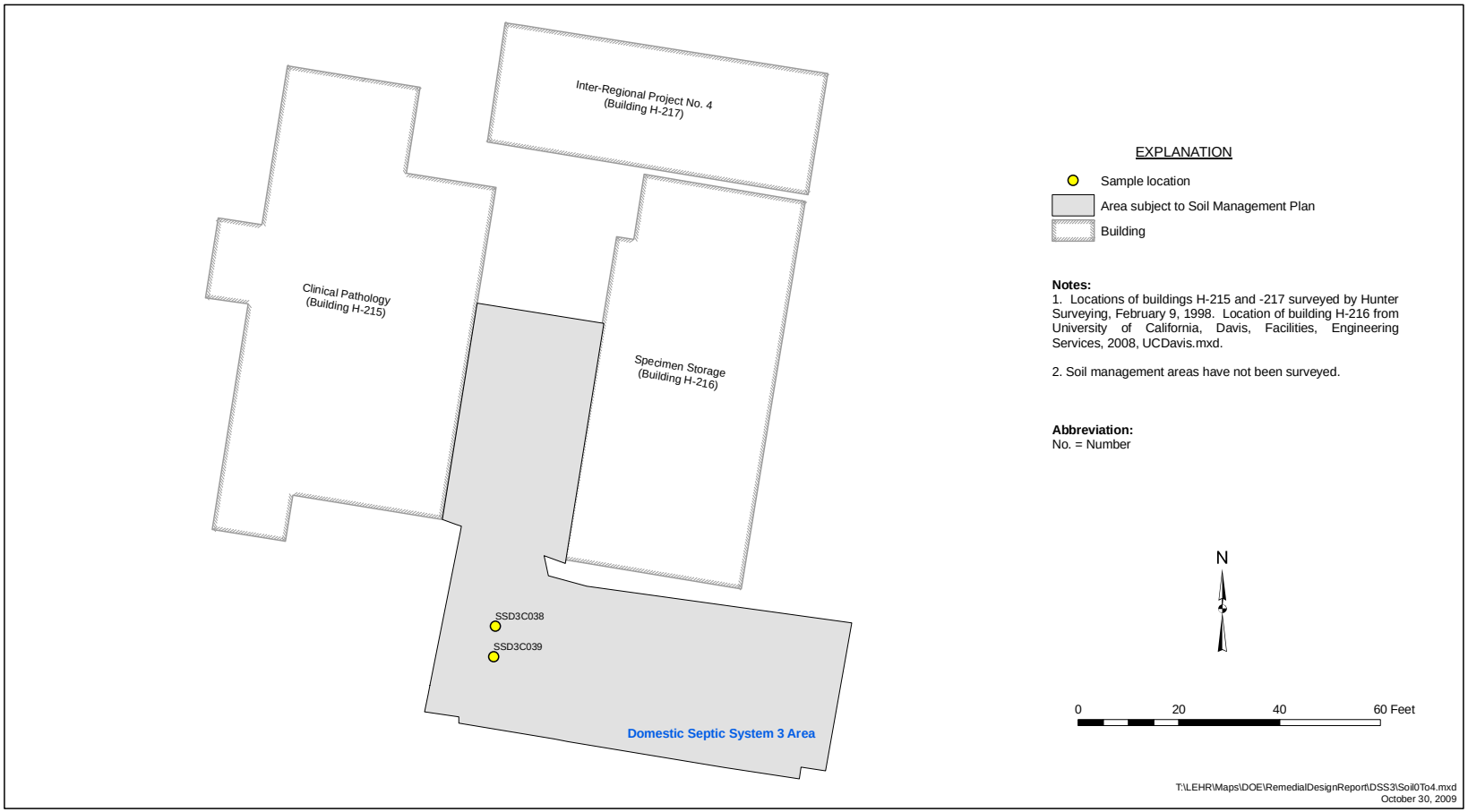
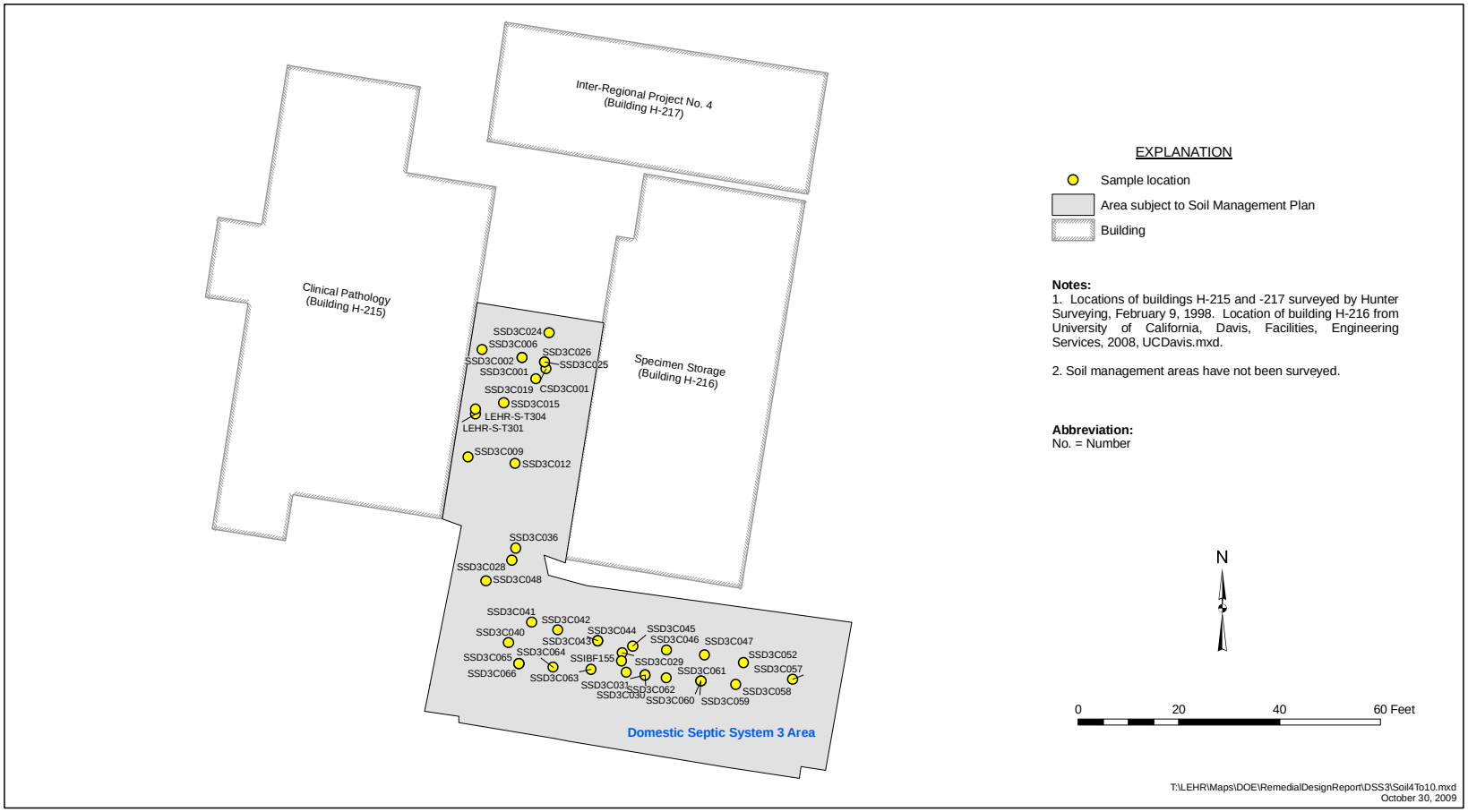
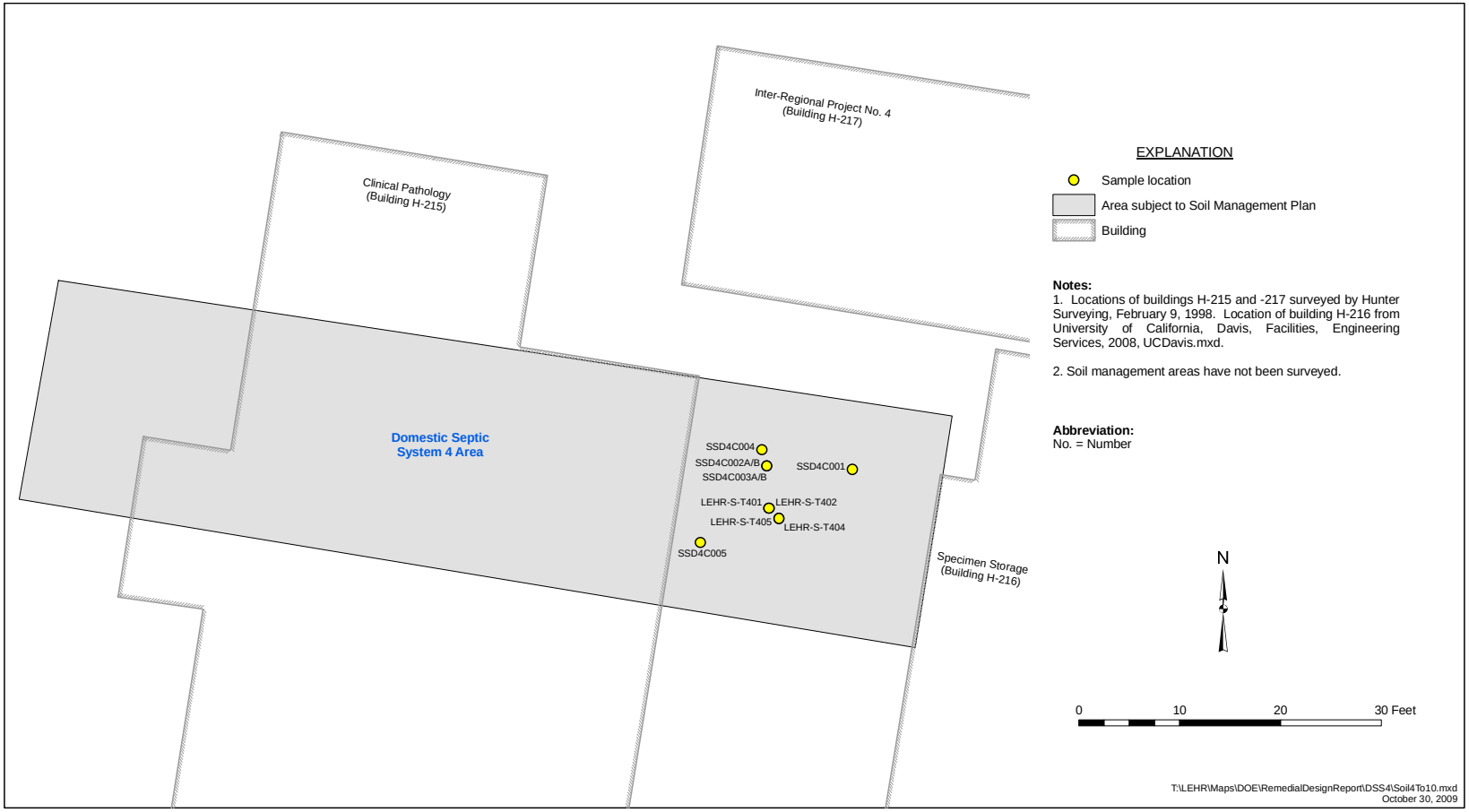


Attachment B Figure 1. Soil Sample Locations for the Domestic Septic System 3 Area (0 to 4 Feet Below Ground Surface)



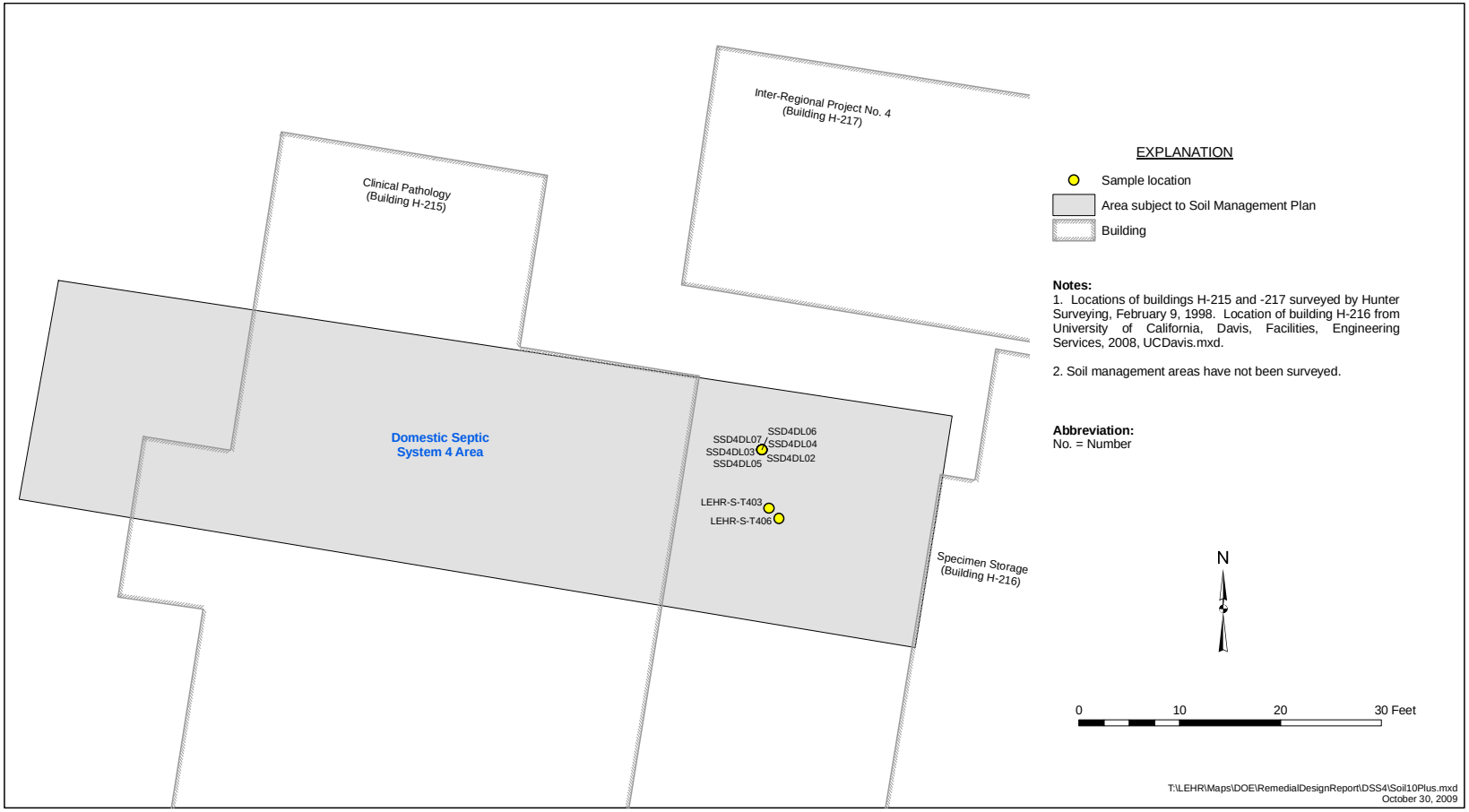
Attachment B Figure 2. Soil Sample Locations for the Domestic Septic System 3 Area (>4 to 10 Feet Below Ground Surface)

Attachment B Figure 3. Soil Sample Locations for the Domestic Septic System 3 Area (>10 to 40 Feet Below Ground Surface)

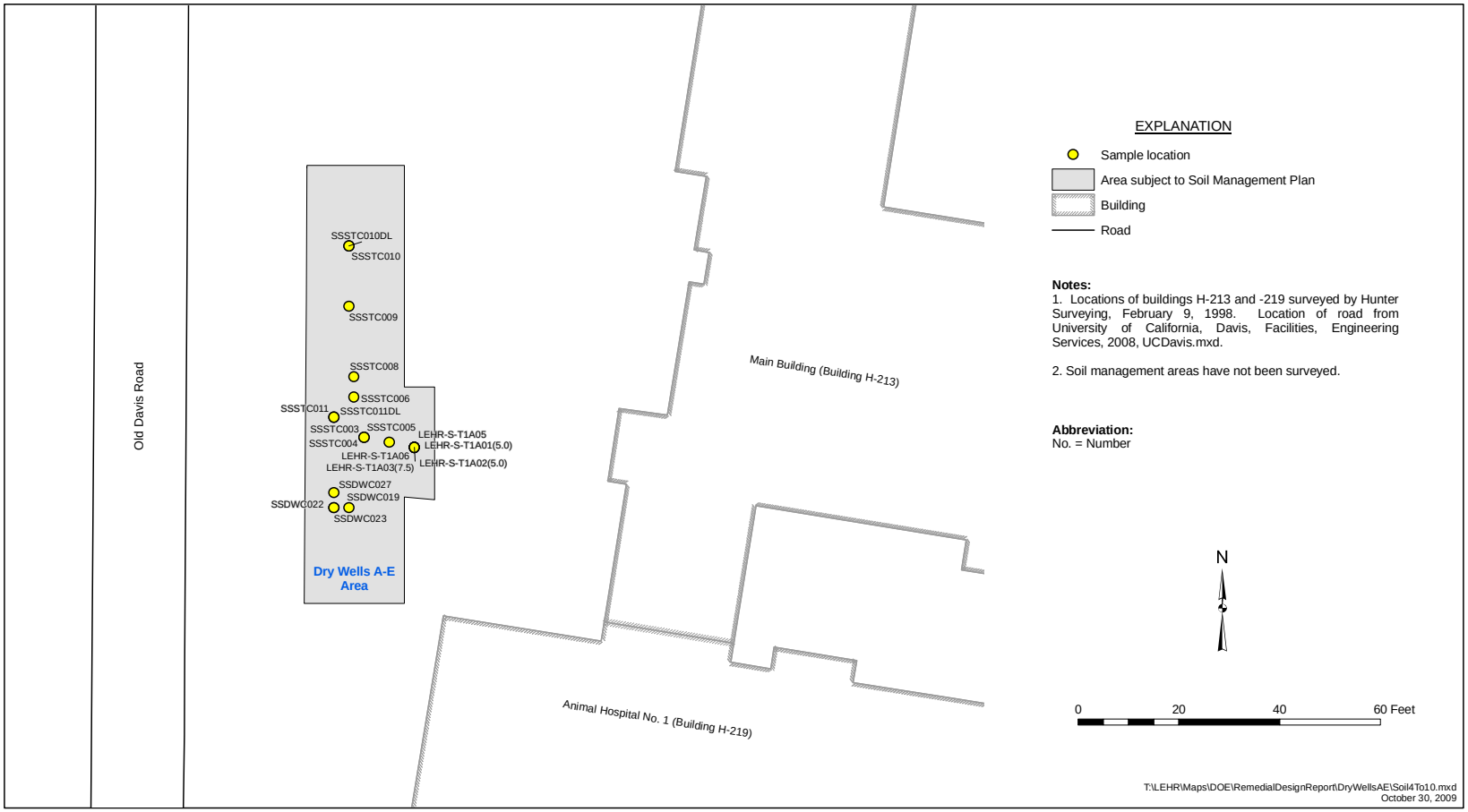


Attachment B Figure 4. Soil Sample Locations for the Domestic Septic System 4 Area (>4 to 10 Feet Below Ground Surface)

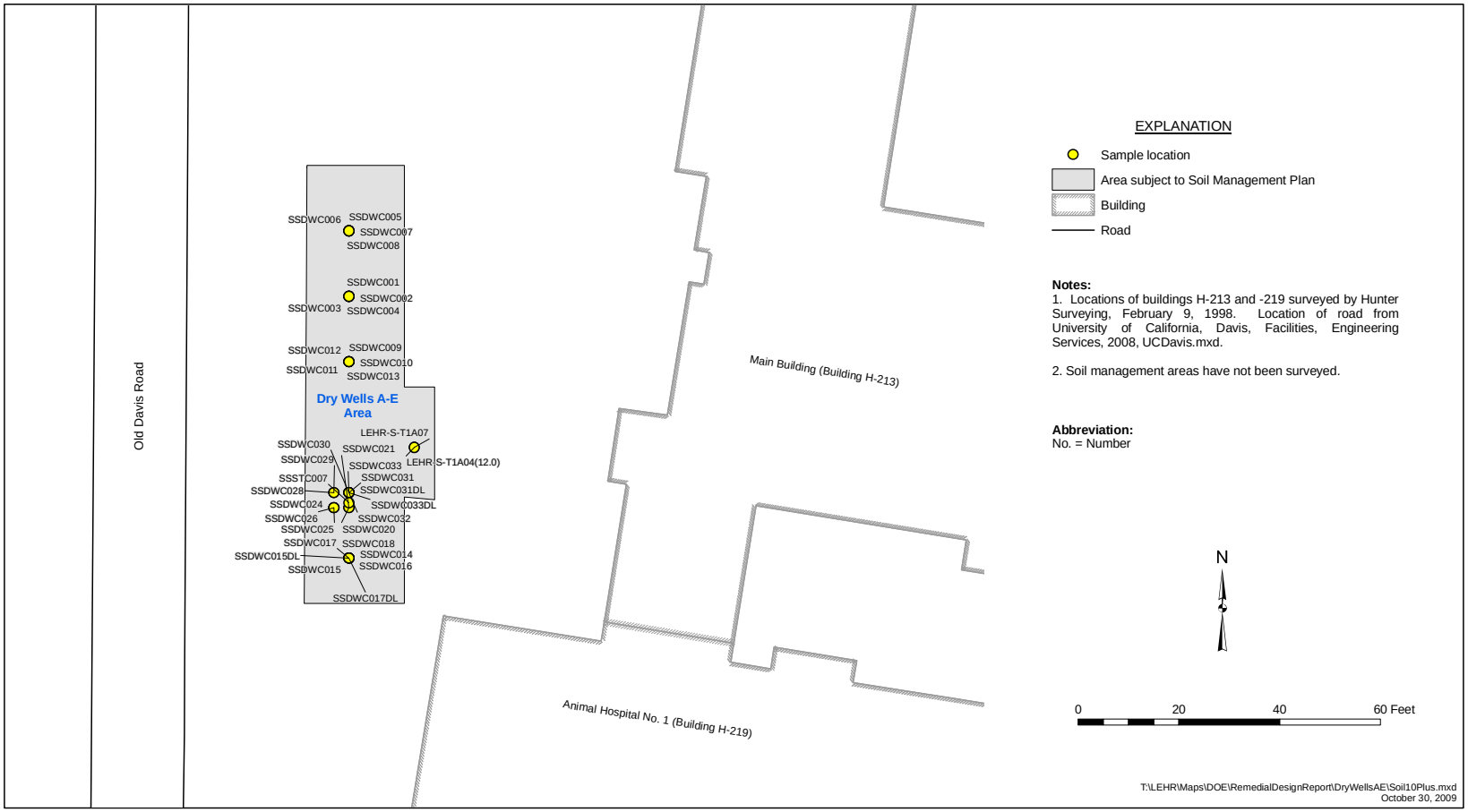
Note: No sample data exists for soil beneath Building H-215. Contamination similar in nature to that reflected by existing sample data near the building should be expected.



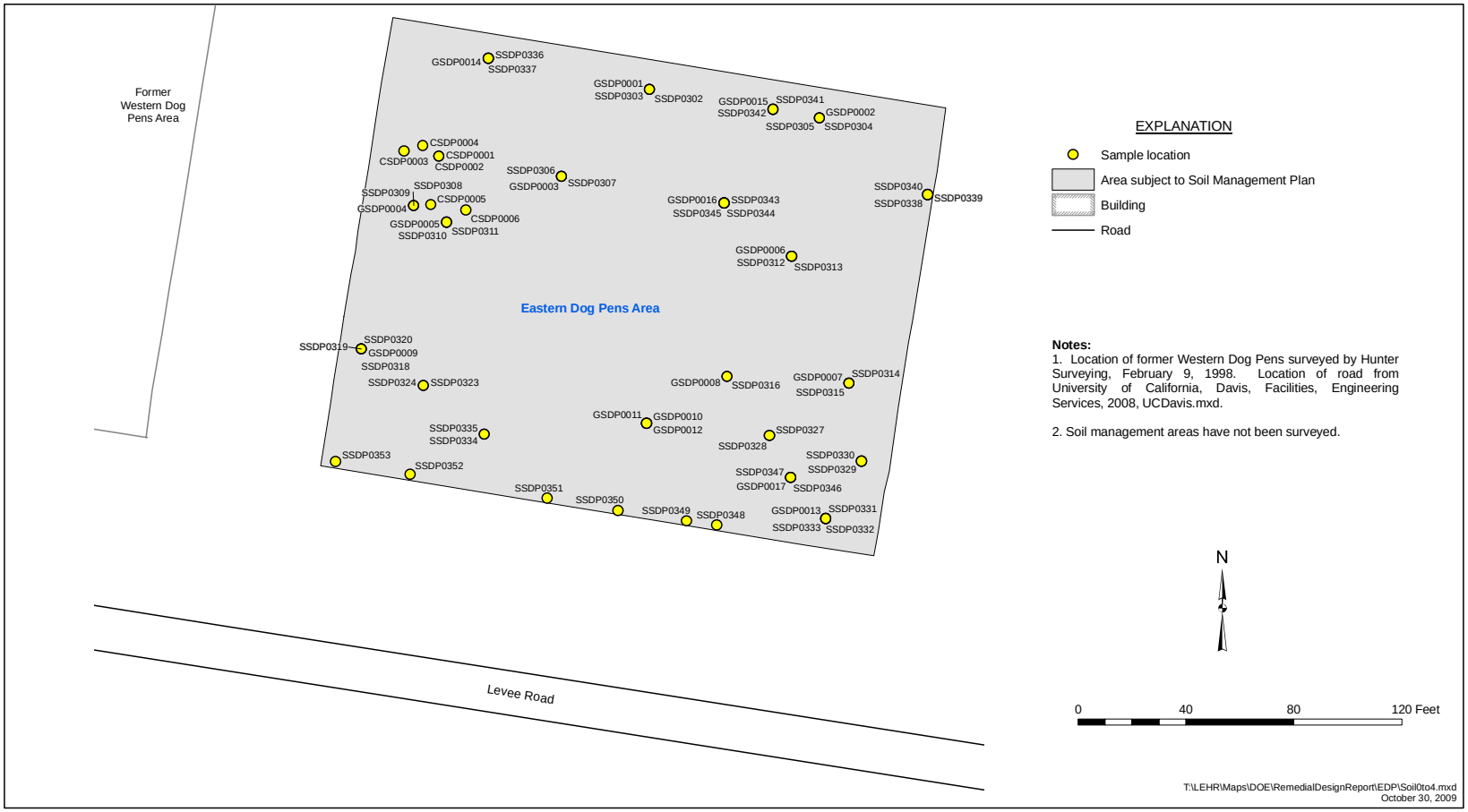
Attachment B Figure 5. Soil Sample Locations for the Domestic Septic System 4 Area (>10 to 37.8 Feet Below Ground Surface)



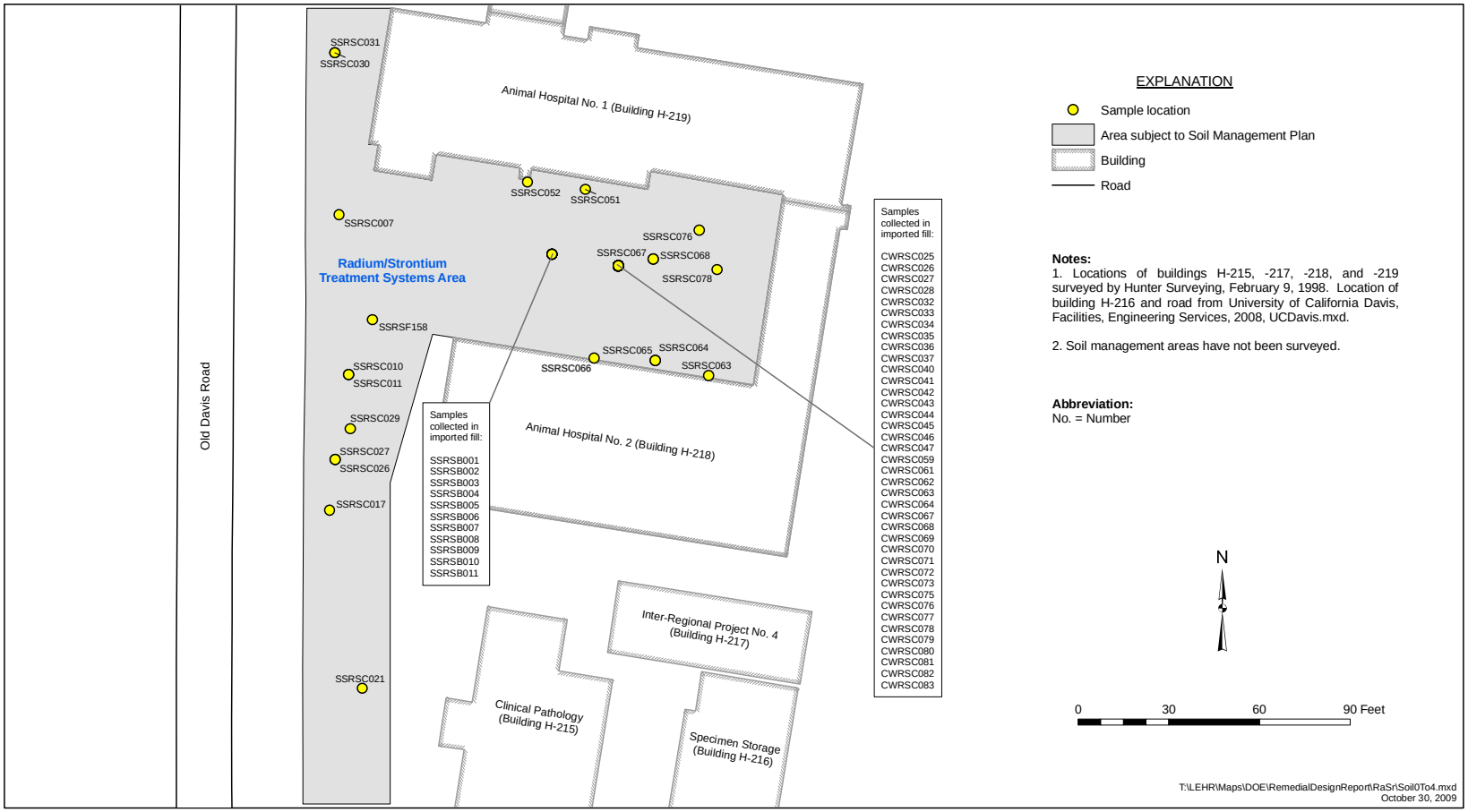
Attachment B Figure 6. Soil Sample Locations for the Dry Wells A-E Area (>4 to 10 Feet Below Ground Surface)



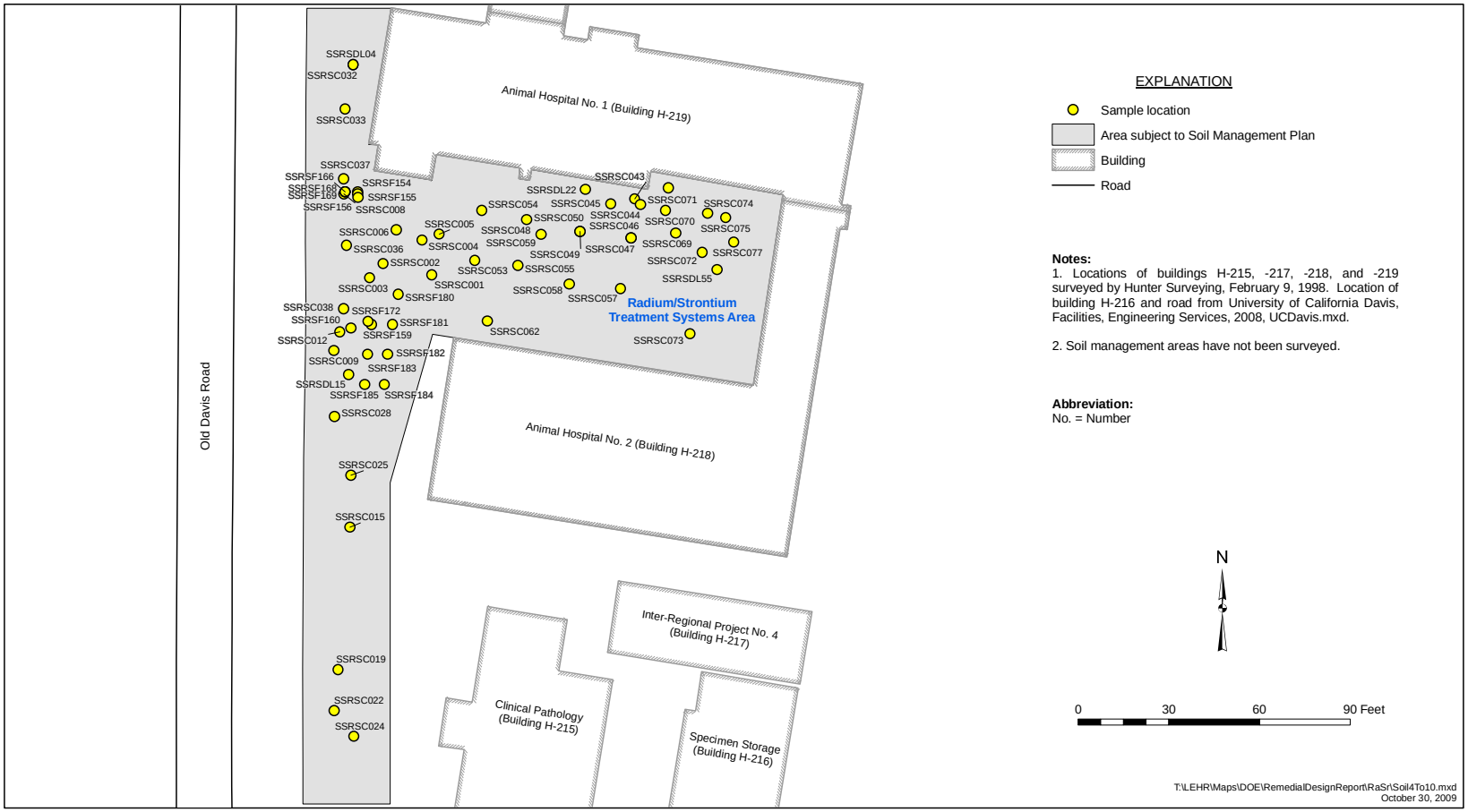
Attachment B Figure 7. Soil Sample Locations for the Dry Wells A-E Area (>10 to 40 Feet Below Ground Surface)



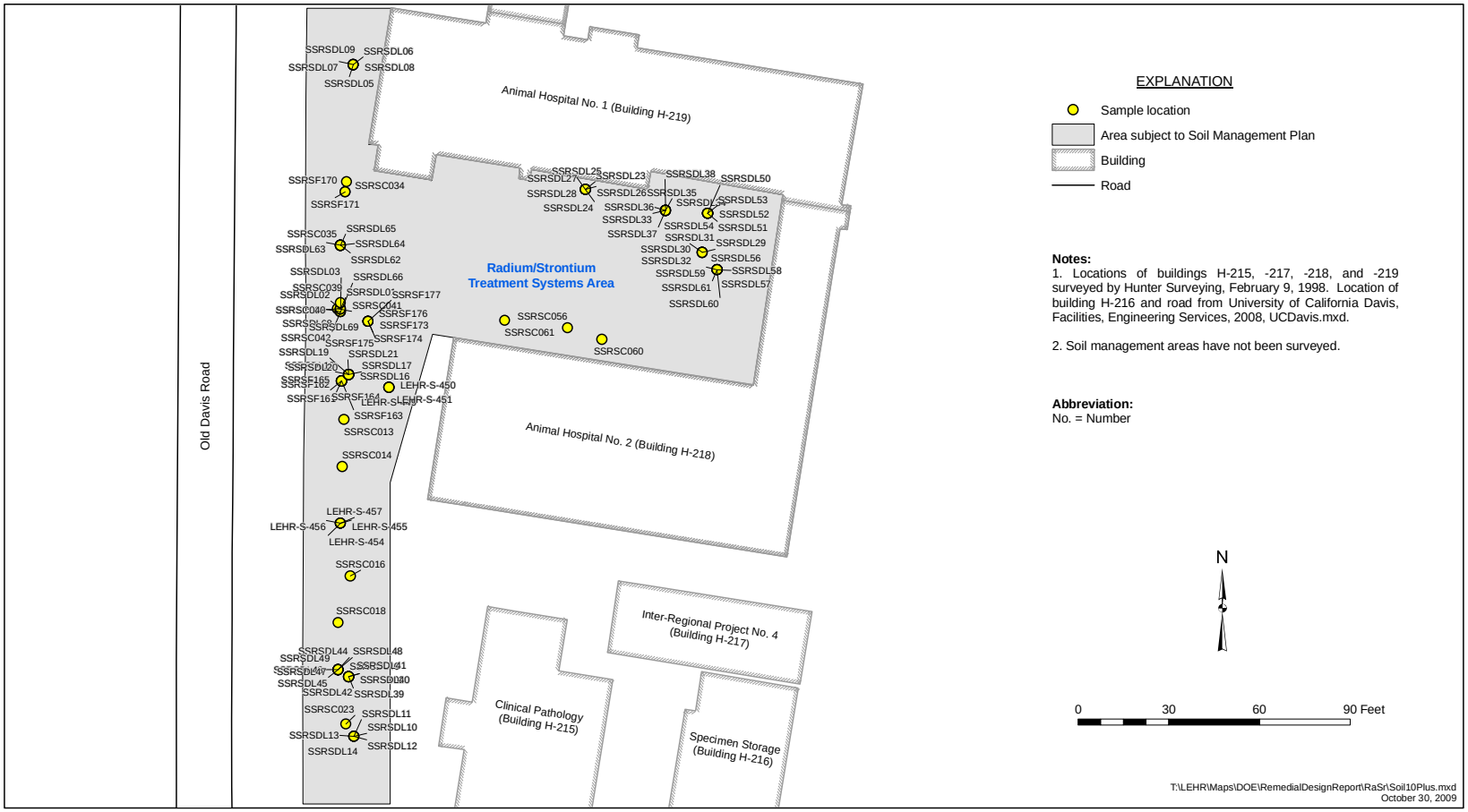
Attachment B Figure 8. Soil Sample Locations for the Eastern Dog Pens Area (0 to 4 Feet Below Ground Surface)



Attachment B Figure 9. Soil Sample Locations for the Radium/Strontium Treatment Systems Area (0 to 4 Feet Below Ground Surface)

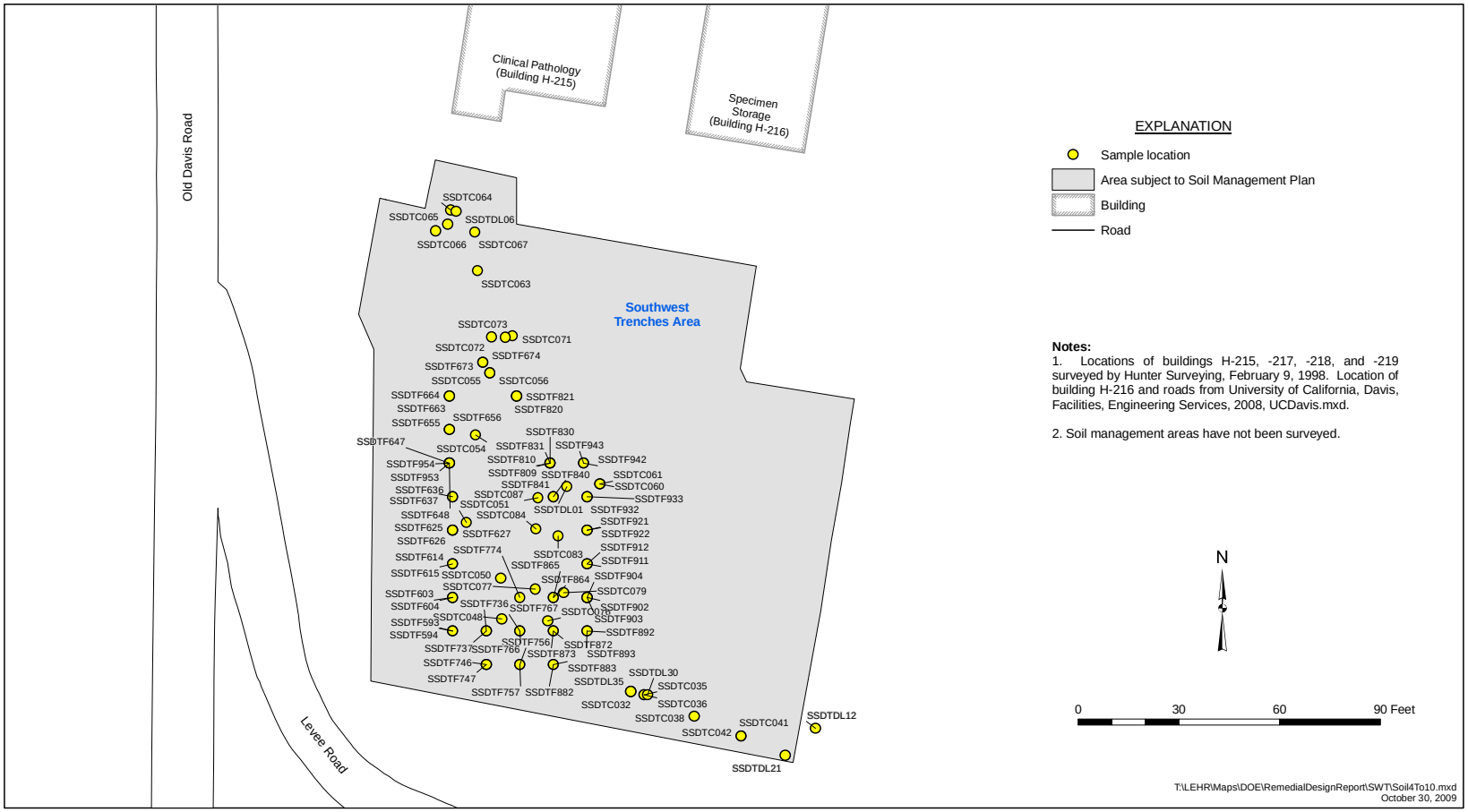


Attachment B Figure 10. Soil Sample Locations for the Radium/Strontium Treatment Systems Area (>4 to 10 Feet Below Ground Surface)

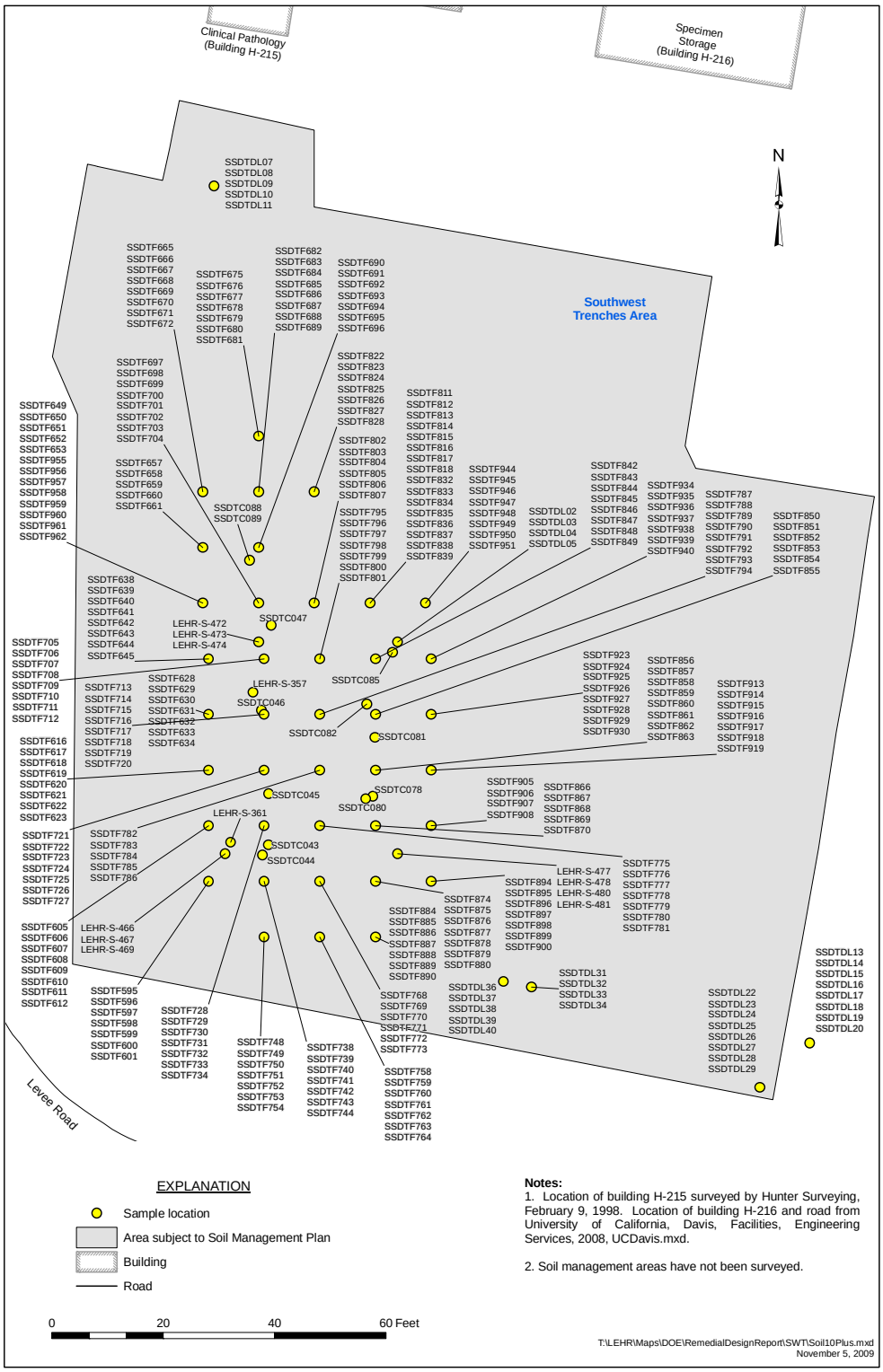


Attachment B Figure 11. Soil Sample Locations for the Radium/Strontium Treatment Systems Area (>10 to 47.5 Feet Below Ground Surface)

Attachment B Figure 12. Soil Sample Locations for the Southwest Trenches Area (0 to 4 Feet Below Ground Surface)



Attachment B Figure 13. Soil Sample Locations for the Southwest Trenches Area (>4 to 10 Feet Below Ground Surface)



Attachment B Figure 14. Soil Sample Locations for the Southwest Trenches Area (>10 to 44 Feet Below Ground Surface)

Attachment C

Analytical Results, Soil Samples Collected in DOE Areas (on CD-ROM)

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Attachment D

Soil Disturbance Permit

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PERMIT APPLICATION FOR SOIL DISTURBANCE AT LEHR SUPERFUND SITE

This section to be completed by unit performing work.

Work requested by: _____

Work to be performed by: _____

Schedule: _____

Describe proposed work, or attach documents describing scope: _____

Anticipated depth of soil disturbance: _____

☐ Map indicating project location(s) and anticipated area(s) of soil disturbance is attached.
☐ List project plans submitted with application: _____

Requestor Signature: _____

Unit: _____

Name/Title: _____
Date: _____

PERMIT CONDITIONS

This section to be completed by EH&S Unit.

☐ Soil disturbed is in areas not subject to SMP for DOE areas. No SMP conditions apply. **STOP HERE.**

☐ Work to be performed in areas subject to SMP for DOE areas.

☐ Site inspection conducted (date)_____

_____

☐ Possible to relocate work to avoid soil disturbance in area subject to SMP. Discussed with project requestor. Describe, and attach site map with alternate location(s): _____

_____

_____

_____

_____

_____

☐ Requestor agrees to relocate work to area not subject to the SMP. Attach new map showing new project location. **STOP HERE.**

☐ Project will disturb soil in area(s) subject to the SMP per survey maps and legal descriptions of DOE areas subject to land-use restrictions. The conditions checked below will be in effect:

☐ All project staff must be trained on aspects of the SMP relevant to their work.

☐ Soil disturbed at 0–10 feet below ground surface will be sampled for constituents in attached table. (attach Table A−1 and indicate sections applicable to area being disturbed.)

☐ Soil disturbed at 0–10 feet below ground surface contaminated above site background may not be reused on site without a risk assessment approved by DTSC and EPA. Soil with contaminant concentrations at or below background will be considered clean and may be reused on site.

☐ Soil disturbed at >10 feet below ground surface will be sampled for constituents determined by professional judgment to be potentially present in the soil in concentrations above site background (source: Attachment C of the SMP).

☐ Soil disturbed at >10 feet below ground surface will not be reused on site without a risk assessment approved by DTSC and EPA if it contains contaminant concentrations above the site background. Soil with contaminant concentrations below background values will be considered clean and may be reused on site.

☐ Non-soil waste (e.g., personal protective equipment) contaminated from contact with site soil must be characterized and managed according to its designation.

☐ The characterization of all waste is the responsibility of the requesting party.

☐ Results of any soil scan/sampling/characterization activities associated with this soil disturbance will be submitted to the EH&S Unit.

☐ Provide map of soil excavation, soil reuse locations, volumes of soil reused, and/or volumes of soil disposed of, and documentation of disposal.

Oversight by an environmental professional is required on a/an [frequency]_____ ___ basis.

☐ Inspection by the EH&S Unit to be conducted on a/an [frequency] _____ _____ basis.

☐ If unusual or unexpected conditions are discovered, such as discoloration or unexpected contamination, during this soil disturbance, the project requestor will immediately notify the

EH&S Unit. The EH&S Unit will coordinate the notification of DOE and the regulatory agencies concerning the unexpected conditions.

Environmental Professional Review. (List documents reviewed and comments on the project's compliance with the SMP; the ROD; and all applicable laws, regulations, and standards.)

Signature:

Name/Title:

Date:

PERMIT APPROVAL

☐ Project Approved

☐ Project Denied (Explain rationale.)

EH&S Unit Representative Signature:

Name/Title:

Date:

Comments on this package are noted below and retained in the file:

PERMIT CLOSE OUT

☐ Required Project Documents Received

☐ Missing Documents and Remedy/Date/Responsible Party

_____

_____

_____

_____

_____

_____

EH&S Unit Representative Signature: _____

_____

Name/Title: _____

_____ Date: _____