LMS/LEH/S24029

Soil Management Plan
Former Laboratory for Energy-Related Health Research Federal Facility
University of California, Davis

August 2019

U.S. DEPARTMENT OF ENERGY | Legacy Management

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Abbreviations

bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
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
FYR	Five-Year Review
LEHR	Laboratory for Energy-Related Health Research
LTS&M	long-term surveillance and maintenance
MDL	method detection limit
MOA	memorandum of agreement
Ra/Sr	Radium/Strontium
RD/RAWP	Remedial Design/Remedial Action Work Plan
ROD	Record of Decision
RPD	relative percent difference
SMP	Soil Management Plan
SOP	Standard Operating Procedure
SWT	Southwest Trenches
UC Davis	University of California, Davis
UCL	upper confidence limit
UTL	upper tolerance limit
WDPs	Western Dog Pens

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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, also called the LEHR site, at the University of California, Davis (UC Davis). This plan also provides direction for managing any trees or shrubs that need to be removed from the DOE areas where this SMP applies. This plan is a component of the Remedial Design/Remedial Action Work Plan (RD/RAWP), which provides requirements for implementing land-use restrictions in accordance with 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. The original version of this SMP (dated November 2010) was included in the RD/RAWP (DOE 2010) as Appendix A. To facilitate the use of this SMP as a reference document for soil and vegetation management projects, and so the plan can be more readily modified in the future if needed, this new version of the SMP (Revision 1) is being produced as a stand-alone document.

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 offsite 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 UC Davis (Figure 1 and Figure 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 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 its areas.

In 1995, DOE demolished the Imhoff Wastewater Treatment Facility (Figure 2) as a voluntary removal action, and by 1997, DOE had completed the decontamination and decommissioning of the remaining buildings at LEHR. DOE was responsible for the remediation of residual subsurface contamination at the Radium/Strontium (Ra/Sr) Treatment Systems; a waste burial area known as the DOE Disposal Box; onsite 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 Domestic Septic System [DSS] 2, parts of DSS 1, and parts of the DSS 5 leach field [including Dry Wells A–E]), the Western Dog Pens (WDPs) area, and the DSS 3 and 6 areas (Figure 2).

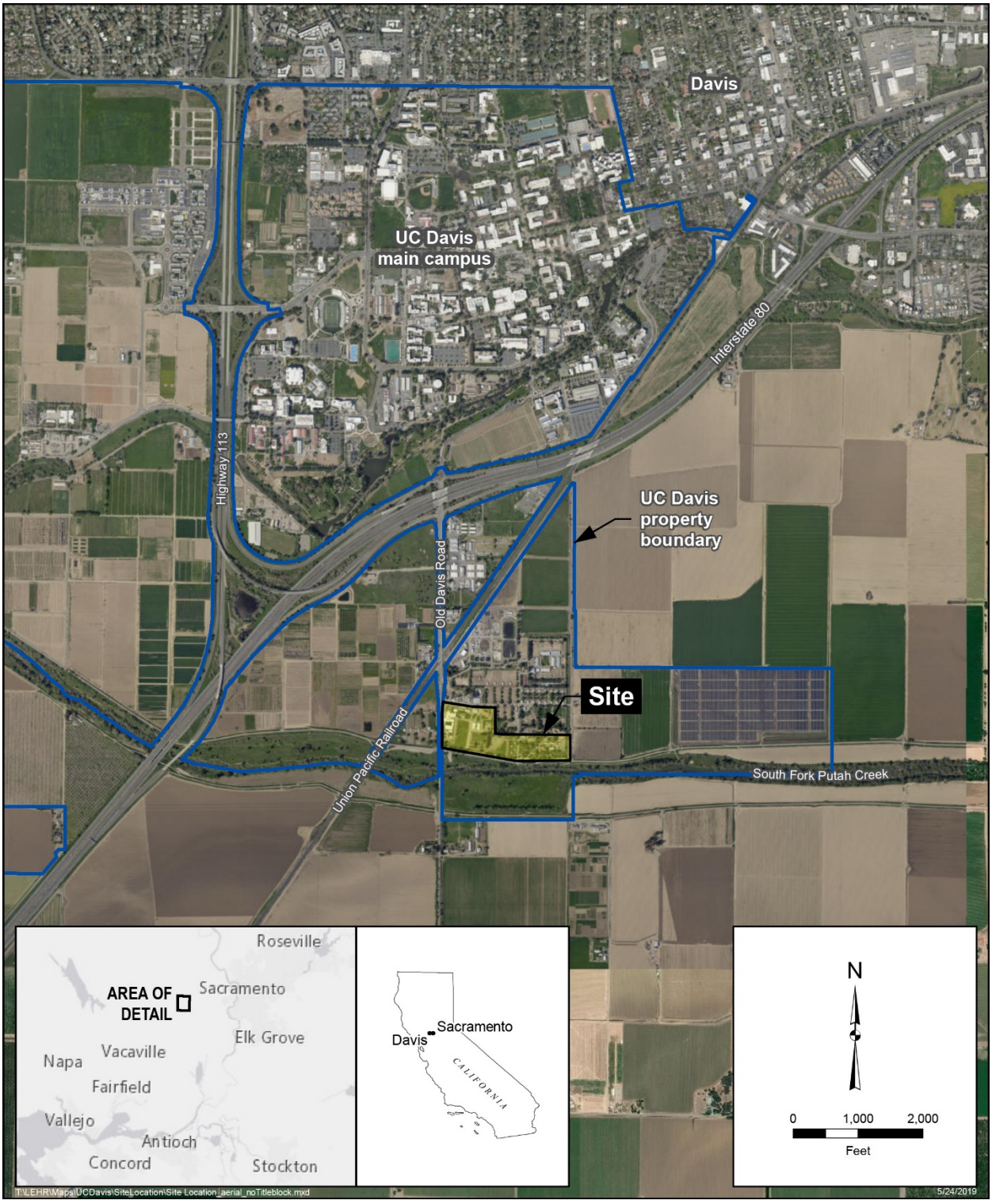

Figure 1. Location of the LEHR Site, UC Davis, Solano County, California

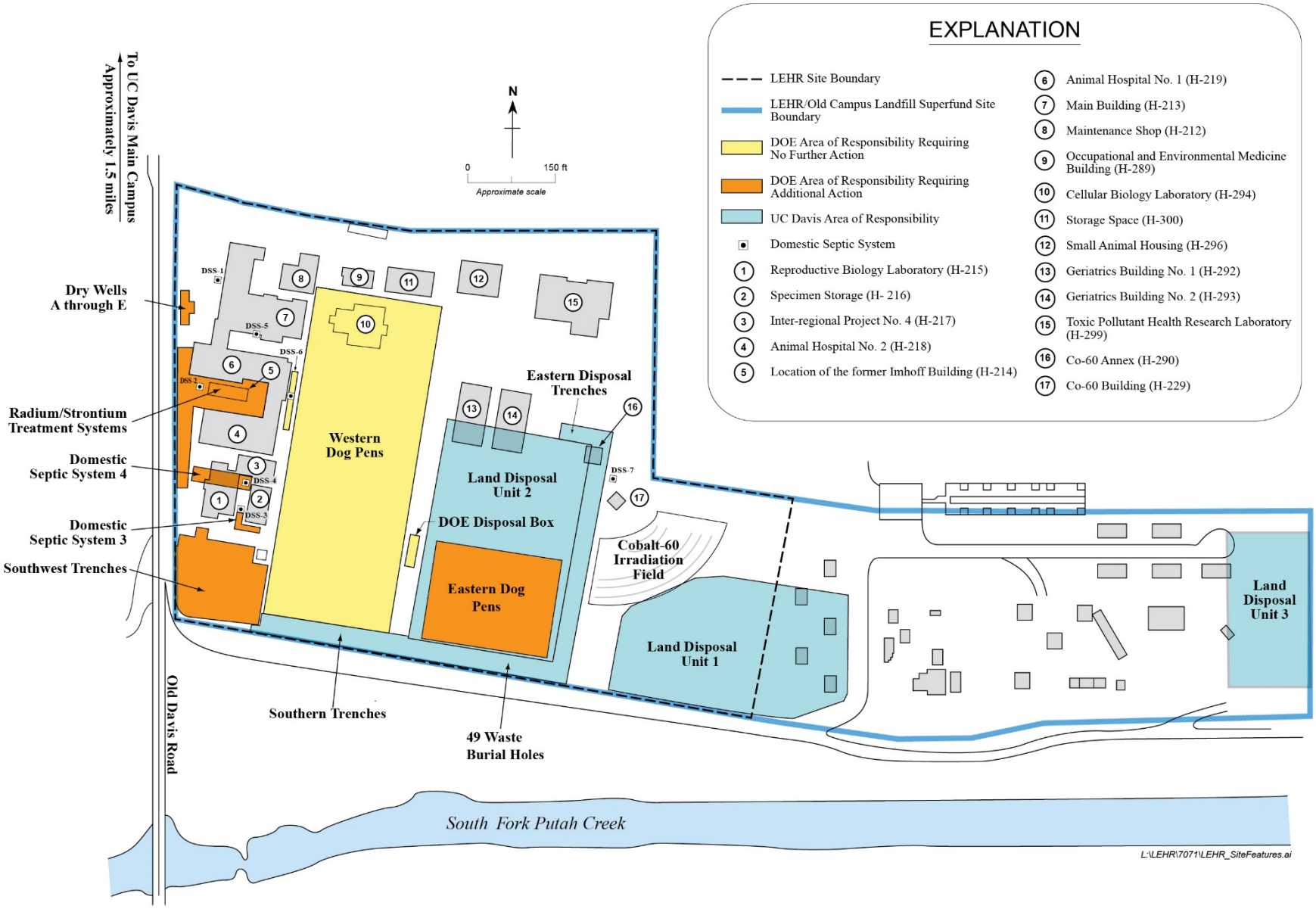

Figure 2. LEHR Site Features

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 unrestricted use (DSS 4 area only), or that could impact groundwater above acceptable background levels (Ra/Sr Treatment Systems area, DSSs 3 and 4, Dry Wells A–E, the SWT area, and the Eastern Dog Pens [EDPs]) as discussed below.

1.1.1 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, no action or no further action is required at all LEHR buildings (62 FR 51844–51845).

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 area
- The WDPs area (Figure 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 2 shows all these areas and their designations.

1.1.2 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
- The EDPs area (Figure 3)

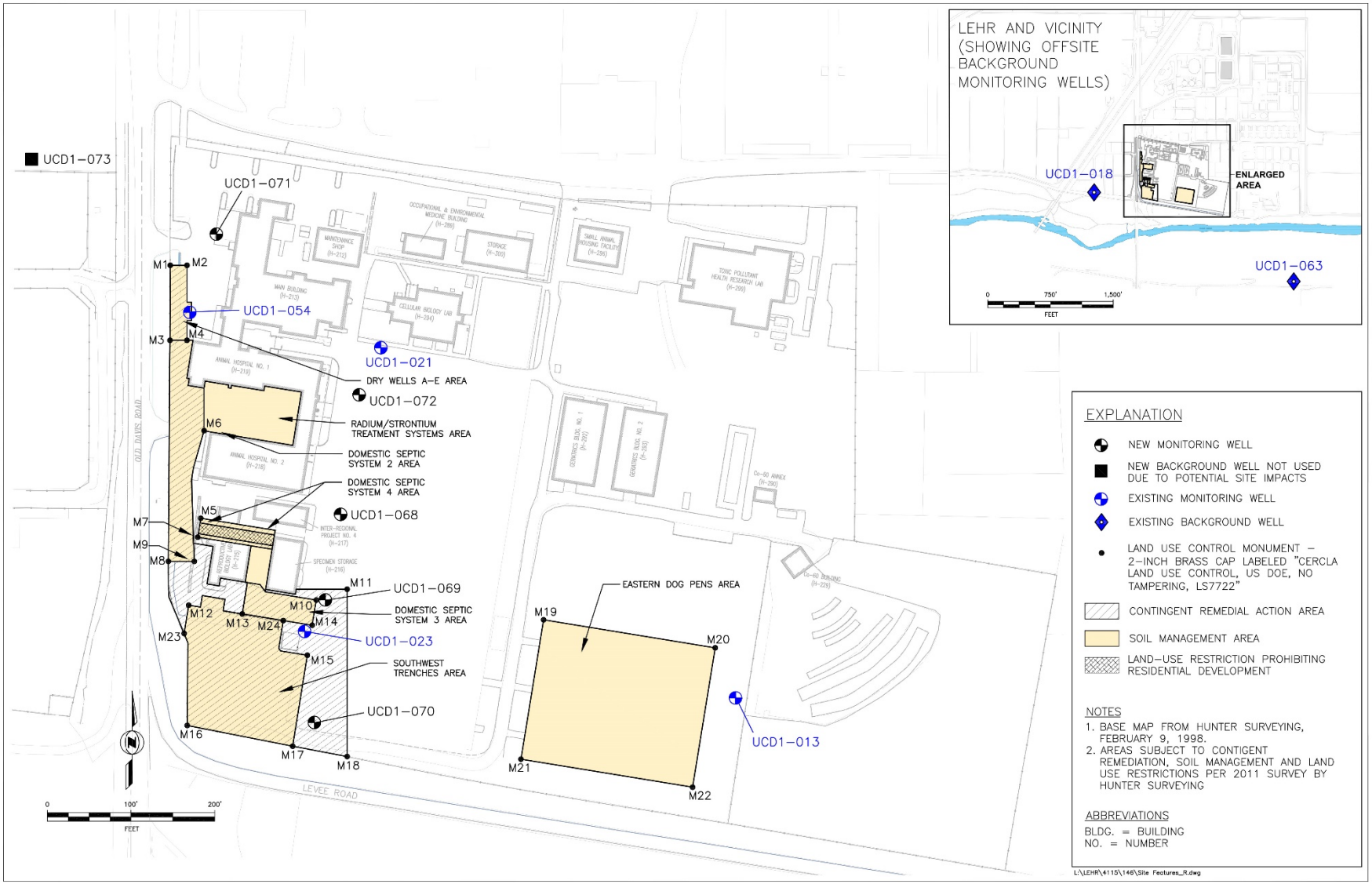

Figure 3. DOE Areas at LEHR Subject to Land-Use Controls, Including Soil Management

1.1.3 Record of Decision

To address areas requiring additional action, DOE completed a ROD in 2009 (DOE 2009a).

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[1]
- Long-term groundwater monitoring with contingent remediation, a land-use restriction prohibiting residential use, and an SMP at DSS 4
- The implementation of an SMP and groundwater monitoring for constituents of potential concern 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 (DOE 2010) and include the development and implementation of this SMP (which was originally an appendix to the RD/RAWP and is now issued as a stand-alone document) to specify controls that would apply to activities that disturb the subsurface. The general requirements of the RD/RAWP and this SMP were documented in an environmental land-use covenant recorded by Solano county in 2014 (DTSC 2014) (Appendix A).

1.1.4 First Five-Year Review

In 2016, DOE conducted the first Five-Year Review (FYR) for the DOE areas (DOE 2016). That first FYR concluded that a protectiveness determination for the vapor intrusion pathway could not be made without (1) further evaluation of existing data, and (2) if needed, the collection and evaluation of soil gas data from certain locations within the DOE areas.

On the basis of additional soil gas data acquired in 2017 and 2018 presented in the Vapor Intrusion Evaluation Report (DOE 2018a), DOE's FYR report addendum (DOE 2018b) included the finding that potential vapor intrusion risks were acceptable and that the remedy for the DOE areas was protective. The FYR report addendum was approved by EPA on October 25, 2018.

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. As an outcome of the first FYR (DOE 2016), the objective has been expanded to include establishing requirements for the management of any trees or shrubs that fall or must be removed in the SMP areas.

[1] See Section 2.9 of the ROD.

1.3 Purpose

This SMP describes specific controls required for compliance with the ROD (DOE 2009a). The purpose of the SMP is to:

- Prevent unacceptable exposure to contaminated soil and potentially contaminated trees and shrubs.
- Prevent the improper disposal of these materials.

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, trees, and shrubs that might be disturbed during construction, maintenance, or other activities.
- Requirements for emergency work or responses to natural events that might disturb contaminated soil, trees, and shrubs.
- Inspection requirements.
- Recordkeeping and reporting requirements.

1.5 Applicability

This SMP applies to soil-disturbing activities and tree and shrub disposal performed at the DOE areas at LEHR identified in Figure 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 1.1.1 above).

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

- Work is conducted at depths less than 1 foot below ground surface (bgs).
- 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 the FYR 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 Regents) 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 FYR 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 FYRs 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 UC Regents are responsible for:

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

2.2.2 UC Davis Finance, Operations & Administration Division

The UC Davis Finance, Operations & Administration (FOA) Division provides financial, human resources, campus planning, construction management, facilities, , and safety services on the UC Davis campus.

2.2.2.1 EH&S Unit

The EH&S Unit within Safety Services, which is part of the FOA Division, reviews and approves projects conducted by the Design and Construction Management, Facilities Management, Campus Planning & Environmental Stewardship, 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 is also responsible for communicating this information as-needed to entities that might perform unplanned and/or emergency work in the DOE areas, including the Fire Department, Police Department, Facilities Management and designated emergency response staff at nearby campus facilities, including the Center for Health and the Environment, the Center for Equine Health, and the California Raptor Center.

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.
- Campus stakeholders potentially affected by the restrictions receive annual training.

On an annual basis, the EH&S Unit shall determine which campus stakeholders from the units and facilities listed above may be affected by the restrictions, and therefore should receive training. The EH&S Unit shall determine the training contents, and may tailor the training depending on whether the entities involved may be conducting planned work following the steps outlined in Section 4.0 or only as-needed emergency work following the steps in Section 5.0.

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 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 thereof—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.

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3.0 Areas and Contaminants Subject to Soil Management Requirements

This SMP applies to areas where potential contaminants remain in soil (Figure 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. Appendix B lists constituents that may be present in site soils from 0 to 10 feet bgs. Appendix C provides the figures of the soil sample locations, and Appendix D provides the analytical data for these samples. All contaminants present in soil above background concentrations should be considered when soil is evaluated for onsite reuse or offsite disposal.

Site risks from the residual contamination in soil were quantified and characterized in the sitewide risk assessments (UC Davis 2004, UC Davis 2006, Weiss 2005) that addressed human health, ecological receptors, and groundwater resources. These risk assessments were reviewed, and risks were reassessed as part of the first FYR (DOE 2016). 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 onsite resident was below this threshold at the DSS 3, Dry Wells A–E, and Ra/Sr Treatment Systems areas. The risk assessments also indicated that the potential risk to onsite construction workers was less than 1 in 1 million at the DSS 3, Dry Wells A–E, Ra/Sr Treatment Systems, SWT, and EDPs areas.

The risk calculations were based on conservative assumptions. Risk to a hypothetical onsite resident was based on exposure to soil through direct dermal contact, ingestion, inhalation of soil particulates, ingestion of homegrown 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 human health risk to a hypothetical onsite resident estimated in the risk assessments for DOE areas (Weiss 2005, DOE 2016) was above 1 in 1 million for some contaminants at the DSS 4, EDPs, and SWT areas. In the original risk assessment (Weiss 2005), the highest risk to the hypothetical onsite resident was 4 in 10,000 from benzo(*k*)fluoranthene at DSS 4, primarily due to ingesting homegrown produce (Weiss 2005). This risk was estimated at 6 in 1 million when reevaluated as part of the FYR, and the highest risk to the hypothetical onsite resident was 9 in 100,000 from benzo(*a*)pyrene at DSS 4, primarily due to soil ingestion (DOE 2016). 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) (Weiss 2005, DOE 2016). Onsite construction workers were estimated to have a 1 in 1 million risk from benzo(*a*)pyrene in subsurface soil at DSS 4 in

the original risk assessment (Weiss 2005); the risk was estimated at 2 in 1 million when reevaluated as part of the FYR (DOE 2016).

In Table 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 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 in Figure 3.

Table 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% detection
	1,4-Dichlorobenzene	>5% detection
	2-Butanone	>5% detection
	2-Methylnaphthalene	>5% detection
	Acetone	>5% detection
	alpha-Chlordane	>5% detection
	Aroclor-1254	>5% detection
	Benzaldehyde	>5% detection
	Bis(2-ethylhexyl)phthalate[b]	>5% detection
	Butylbenzylphthalate	>5% detection
	Di-*n*-butylphthalate	>5% detection
	Di-*n*-octylphthalate	>5% detection
	Dieldrin	>5% detection
	Diethylphthalate	>5% detection
	Endrin aldehyde	>5% detection
	Formaldehyde[GW]	>5% detection
	gamma-Chlordane	>5% detection
	Hexachlorobenzene	>5% detection
	Isopropylbenzene	>5% detection
	Methyl acetate	>5% detection
	Pyrene	>5% detection
	Styrene	>5% detection
	Toluene	>5% detection
	Trichlorofluoromethane	>5% 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% detection
	2-Methylnaphthalene	>5% detection
	4,4'-DDE	>5% detection
	Acenaphthene	>5% detection
	Acetone[b]	>5% detection
	alpha-Chlordane	>5% detection
	Anthracene	>5% detection
	Benzo(*a*)anthracene[HH]	>5% detection
	Benzo(*a*)pyrene[HH]	>5% detection
	Benzo(*b*)fluoranthene[HH]	>5% detection
	Benzo(*g,h,i*)perylene	>5% detection

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

Area	Above-Background Constituent	Statistical Basis[a]
Domestic Septic System 4 (continued)	Benzo(*k*)fluoranthene[HH]	>5% detection
	Bis(2-ethylhexyl)phthalate[b]	>5% detection
	Butylbenzylphthalate	>5% detection
	Carbazole	>5% detection
	Chlordane	>5% detection
	Chrysene	>5% detection
	Dibenzo(*a,h*)anthracene[HH]	>5% detection
	Dibenzofuran	>5% detection
	Ethylbenzene	>5% detection
	Fluoranthene	>5% detection
	Fluorene	>5% detection
	gamma-Chlordane	>5% detection
	Heptachlor	>5% detection
	Heptachlor epoxide	>5% detection
	Indeno(1,2,3-*cd*)pyrene[HH]	>5% detection
	Methylene chloride[b]	>5% detection
	Naphthalene	>5% detection
	Phenanthrene	>5% detection
	Phenol	>5% detection
	Pyrene	>5% detection
	Styrene	>5% detection
	Toluene	>5% detection
	Xylenes	>5% 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% detection
	alpha-Chlordane	>5% detection
	Ethylbenzene	>5% detection
	gamma-Chlordane	>5% detection
	Toluene	>5% detection

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

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% detection
	4,4'-DDE	>5% detection
	4,4'-DDT	>5% detection
	alpha-Chlordane	>5% detection
	Aroclor-1254	>5% detection
	Chlordane	>5% detection
	Dieldrin[HH]	>5% detection
	Endrin	>5% detection
	gamma-Chlordane	>5% 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% detection
	4,4'-DDE	>5% detection
	4,4'-DDT	>5% detection
	Acetone[b]	>5% detection
	alpha-Chlordane	>5% detection
	Bis(2-ethylhexyl)phthalate[b]	>5% detection
	Chlordane	>5% detection
	Di-*n*-butylphthalate	>5% detection
	Ethylbenzene	>5% detection
	gamma-Chlordane	>5% detection
	Methylene chloride[b]	>5% detection
	Toluene	>5% detection
	Xylenes	>5% detection

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

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% detection
	4,4'-DDD	>5% detection
	4,4'-DDE	>5% detection
	4,4'-DDT	>5% detection
	alpha-Chlordane	>5% detection
	Dieldrin	>5% detection
	Ethylbenzene	>5% detection
	Formaldehyde	>5% detection
	gamma-Chlordane	>5% detection
	Heptachlor	>5% detection
	Heptachlor epoxide	>5% detection
	Toluene	>5% detection
	Xylenes	>5% 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 is 5% 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:

DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
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% lower confidence limit on the 95th percentile).
WRS = Wilcoxon rank sum

4.0 Soil and Vegetation Management During Planned Activities

Soil with residual contamination may be encountered during maintenance, excavation, trenching, and other soil-disturbing activities at DOE areas at LEHR. Trees or shrubs within the areas subject to this SMP may also need to be removed for a variety of reasons. All personnel, whether UC staff or contractors, conducting excavation, digging, other soil-disturbing operations, or tree/shrub removal must be made aware that there is a potential for encountering contamination, and must know the procedures for dealing with contamination. All soil-disturbing and tree/shrub removal 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 4 and described below. Section 5.0 discusses emergency work. Tree/shrub removal also includes any partial removal resulting from pruning or fallen branches. Separate from the SMP requirements, any activities that result in the removal of valley elderberry branches exceeding 1 inch in diameter must be conducted only after consultation with, and approval from, the U.S. Fish and Wildlife Service (USFWS 2017).

4.1 Pre-Excavation and Pre-Construction Activities

4.1.1 Permit for Soil-Disturbing and Tree/Shrub Removal Activities

Before any soil-disturbing or tree/shrub removal 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 (Appendix E)—detailing the nature of the project; the project's location; and the expected depth of any proposed trenching, excavation, drilling, other soil disturbance, or tree/shrub removal—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 pre-activity soil or tree/shrub sampling is required based on the intended disposition of the removed material, available contaminant data, offsite disposal facility acceptance requirements, and other factors. As outlined in the permit application (Appendix E), soil disturbed at 0–10 feet bgs and trees/shrubs will be sampled for constituents in Table 1 as appropriate based on location. Soil disturbed at >10 feet bgs 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 Appendix D.

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; Appendix B and Appendix C) 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

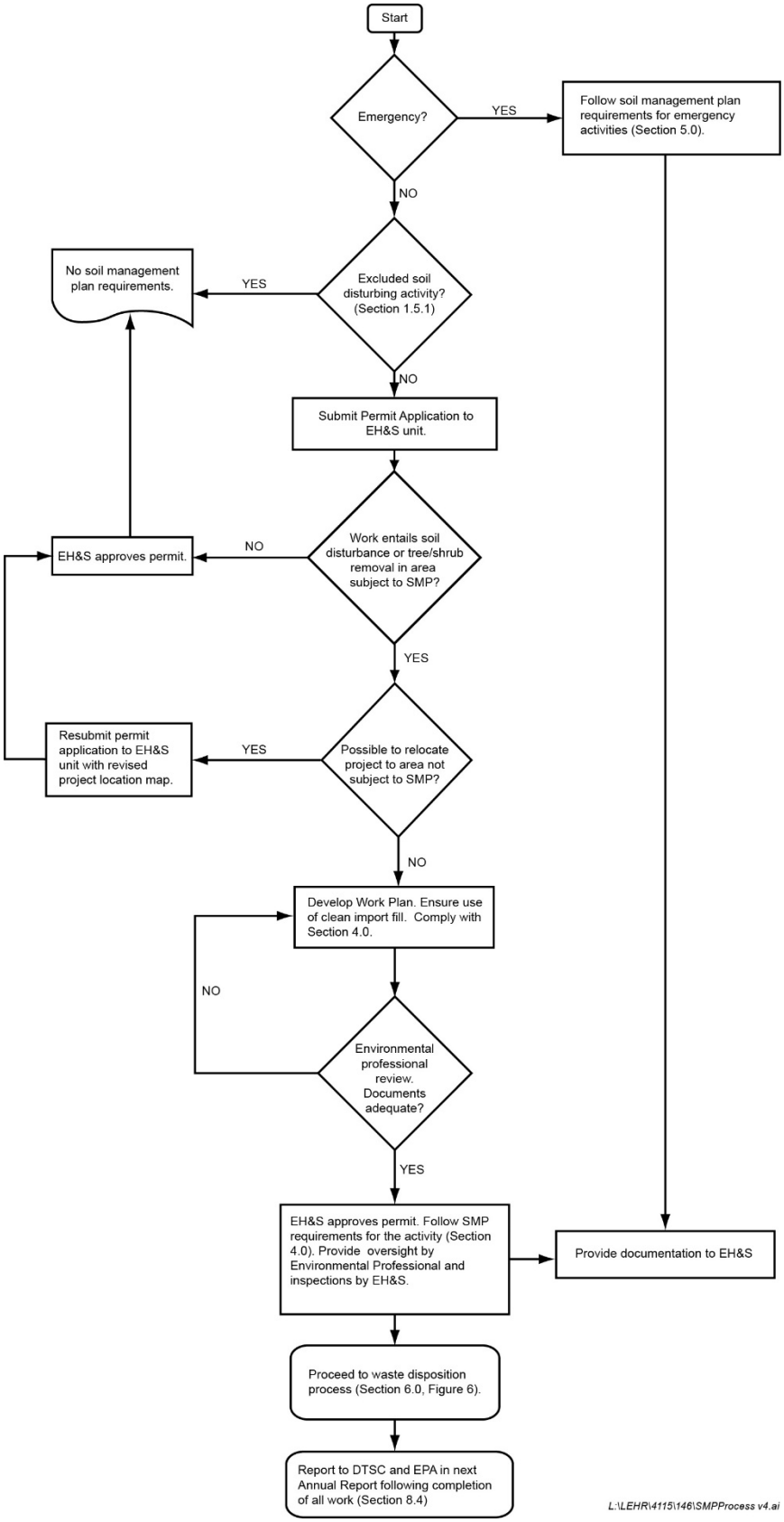

Figure 4. Process for Conducting Nonemergency Work at the DOE Areas of the LEHR Site

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 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 or tree/shrub removal 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 or tree/shrub removal 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.[2] The training related to soil-disturbing and tree/shrub removal 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 or tree/shrub removal activities are conducted, a work plan that covers the following topics shall be developed and approved:

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

[2] The Policy and Procedure Manual can be found at https://manuals.ucdavis.edu/policy-and-procedure-manual.

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.

All plans for soil-disturbing and tree/shrub removal 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 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 offsite 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 waste with added radiological constituents, or waste containing only chemical contamination or no contamination. Waste with added radiological constituents should be segregated from waste containing only chemical contamination or no contamination. Waste determined to be hazardous shall be transported by a licensed hauler to a permitted hazardous waste disposal facility. Waste 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 bgs shall be segregated and returned to backfill the top of the excavation if soils will not be sampled. Waste with added radiological constituents should be segregated from waste containing only chemical contamination or no contamination. To facilitate preliminary waste segregation decisions in DOE soil management areas, Appendixes B and C 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 and vegetation 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 appears 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 offsite 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 downwind of the activity. The monitoring will be conducted to ensure that dust levels are maintained below applicable standards, such as those of the Yolo Solano Air Quality Management District.

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, excavation, and tree/shrub removal equipment that was potentially in contact with contaminated material shall be decontaminated at a designated location (i.e., a decontamination zone). The chosen location should be readily accessible and downwind and downgradient of work areas. Gross decontamination should be performed either using a brush to loosen dirt and

then a pressure washer, or by 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.

To reduce the potential of personnel falling into the excavations, open excavations will be demarcated with barricades and caution tape during periods of inactivity and at the end of each workday. 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 onsite or offsite 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 shall comply with requirements of the DTSC *Information Advisory – Clean Imported Fill Material* (DTSC 2001). 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:[3]

- Soil Moisture by ASTM D2216 or equivalent
- Metals (CAM 17) by EPA SW846 Method 6020
- 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 by SW846 Method 8082
- Total petroleum hydrocarbons by SW846 Methods 8015M/8020
- Nitrate by SW846 Method 300.1
- Hexavalent chromium by SW846 Method 7199
- Gross alpha and beta radioactivity by modified EPA Method 900.0
- Gamma-emitting isotopes by Method DOE HASL 300, 4.5.2.3/Ga-010R

[3] 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 results can be converted to wet weight basis when required.

The Sampling and Analysis Plan will name the analytical laboratory(ies) that will conduct the analyses and 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 in Table 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 onsite or offsite sources.

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

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

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 *Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (EPA 1980).
[d] Requires 30-day in-growth time and 1000-minute count time.
[e] *Radioactive Strontium* from *Prescribed 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:

Dry Wells = Domestic Septic System Dry Wells A–E
DSS3 = Domestic Septic System 3
DSS4 = Domestic Septic System 4
EDPs = Eastern Dog Pens
mg/kg = milligrams per kilogram
pCi/g = picocuries per gram
Ra/Sr = Radium/Strontium Treatment Systems
SWT = Southwest Trenches

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5.0 Soil Management During Emergency Work

Emergency excavation, soil-disturbing, or tree removal activities that are required to protect human health, the environment, or property (e.g., a broken gas line, fallen tree) 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 5 shall be followed for emergency work. Separate from the SMP requirements, any activities that result in the removal of valley elderberry branches exceeding 1 inch in diameter must be conducted only after consultation with, and approval from, the U.S. Fish and Wildlife Service (USFWS 2017).

When practicable, the entity conducting emergency activities (see Section 2.0) shall notify the EH&S Unit of the work. The EH&S Unit will provide guidance and may monitor the emergency excavation, soil-disturbing, or tree removal 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 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. Soil excavation areas and holes from tree removal will be replaced with site or imported backfill that has been tested and approved as acceptable as specified in Section 4.2 above.

When emergency excavation, soil-disturbing, or tree removal 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 wastes, 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.

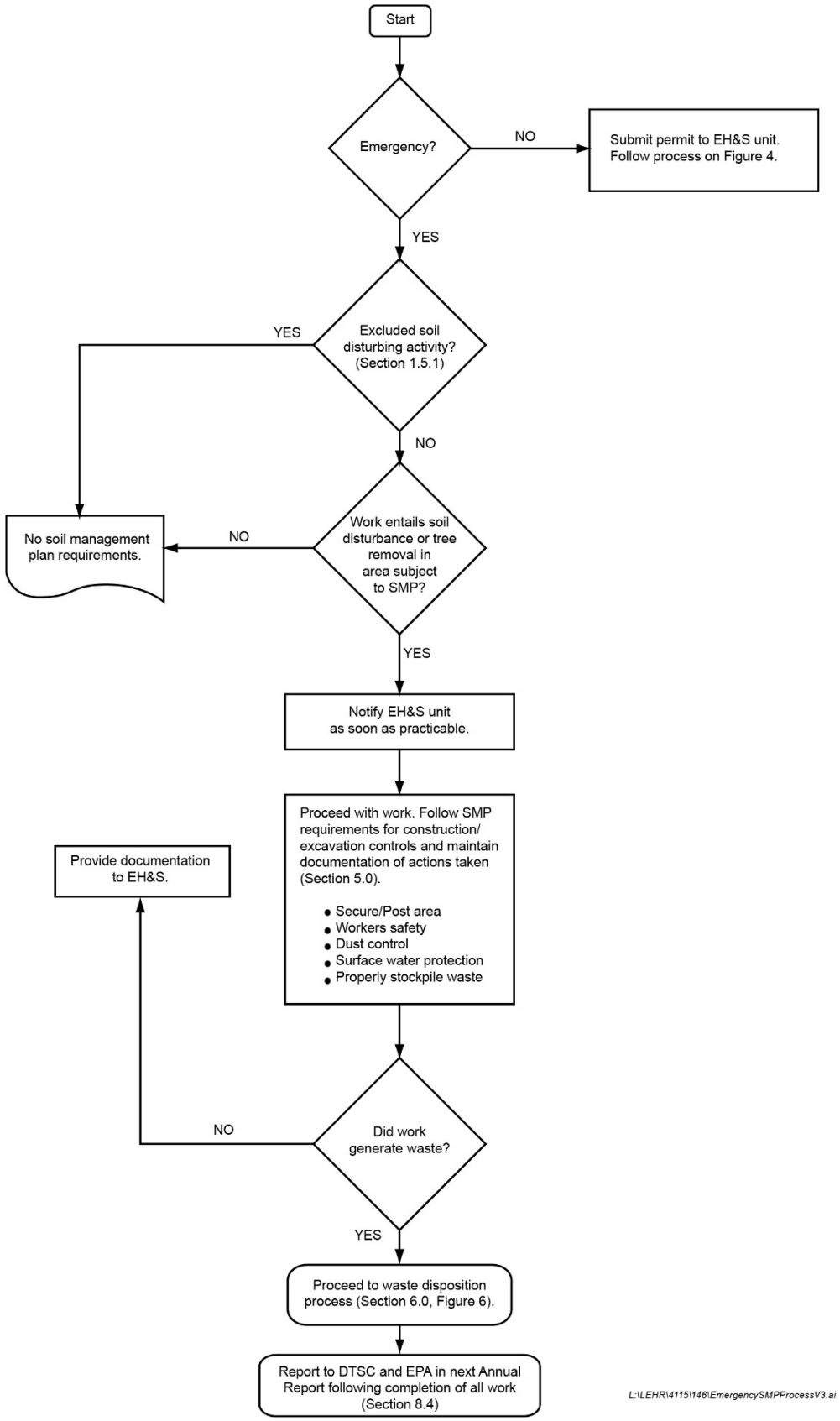

Figure 5. Process for Conducting Emergency Work at the DOE Areas of the LEHR Site

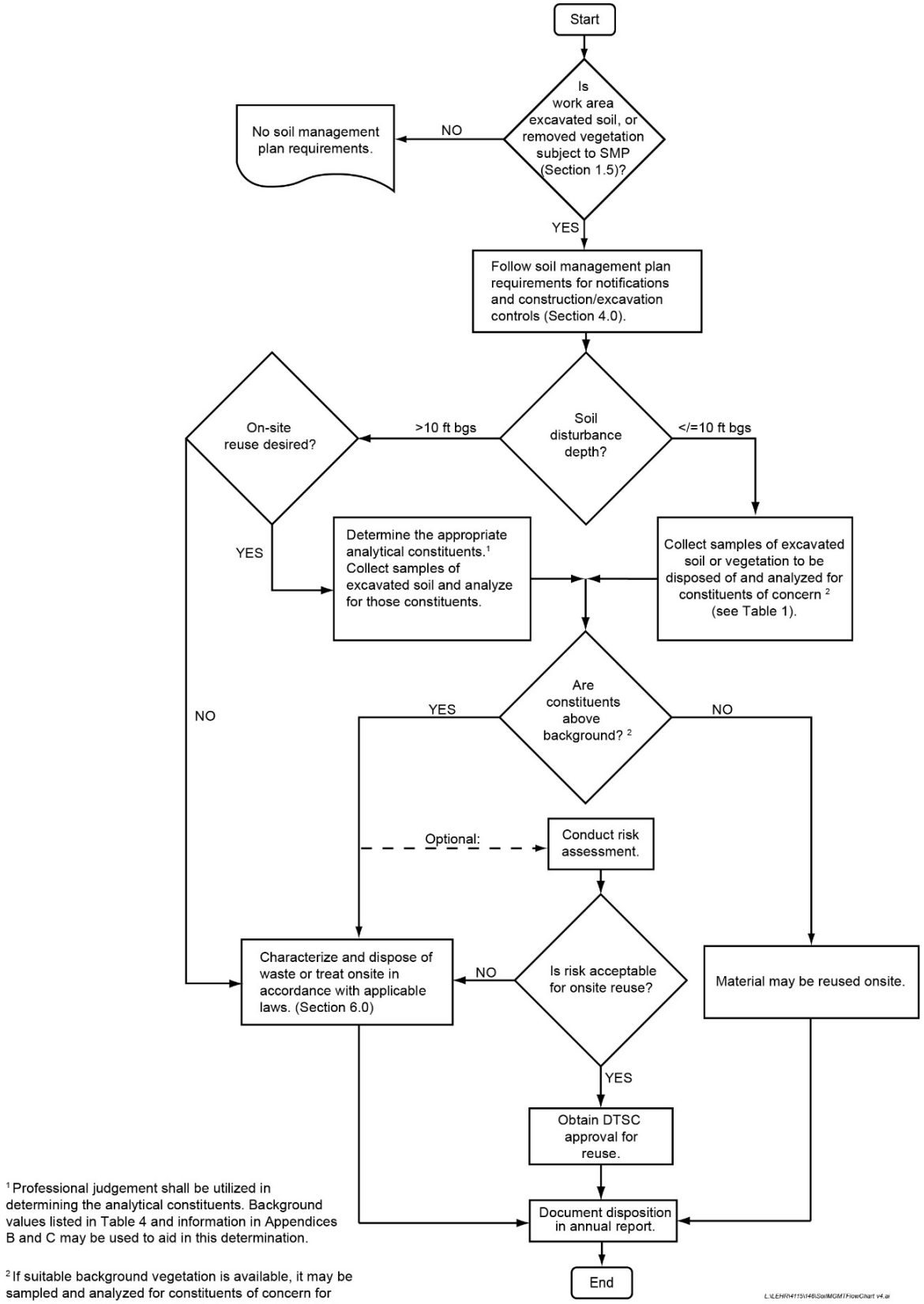

Figure 6. Decision Process for Disposal of Removed Soil and Vegetation

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6.0 Characterization and Disposal of Wastes

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 of removed trees/shrubs, and provides a process for determining how these wastes 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 Waste Designation Categories

Waste soil may be categorized as follows:

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

Waste must be disposed of according to its categorization.

6.2 Waste Characterization

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

6.2.1 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. For soil, the plan shall state that a minimum of one sample per 50 cubic yards be collected. For vegetation, the plan shall provide a sampling strategy to provide data representative of the material to be disposed of. Sample densities must also fulfill disposal facility waste acceptance requirements if the soil or vegetation is not to be reused onsite. The plan shall specify procedures for decontaminating sampling equipment prior to sampling and between sampling locations and shall also include a requirement for collecting duplicate samples for quality control purposes at a rate of at least 10%.

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 ID numbers. Samples should be properly labeled and packaged for shipment along with appropriate documentation. Table 2 lists recommended container types, volume, sample preservation methods, and holding times.

6.2.2 Sample Analysis

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 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. The data provided in this SMP is a resource to aid in the determination of a defensible analytical strategy.

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

Appendix B provides more-detailed information about constituents detected in soil in the 0–10 foot bgs soil horizon. The data in Appendix B 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 6, soil excavated at depths below 10 feet bgs can be either shipped offsite for disposal or evaluated for onsite reuse. A depth-specific evaluation of existing data may be conducted to determine which constituents should be analyzed in excavated soils. Appendix D 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 Appendix D contains analytical results for all samples collected between the ground surface and the deepest depth explored. The data in Appendix D 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. If the waste is not to be reused onsite, analyses performed must meet the requirements of the waste disposal facility.

Table 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 in Table 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 or trees/shrubs to be disposed of must be assessed to verify that it meets the quality requirements in Section 10.2 of the Quality Assurance Project Plan (DOE 2012). 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 are discussed in this section.

First, the data must be reviewed to verify that it meets the quality objectives specified in Section 7.1 of the RD/RAWP. The data shall be valid for determining the disposition of any soil or vegetation 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.
- 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 Standard Operating Procedure (SOP) 21.1 (Appendix I of the RD/RAWP). It should be noted that existing soil data were validated by the project chemist with the data qualifications presented in Appendix D.

As part of the validation process, precision and accuracy will be assessed through the 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 waste management decisions. Sample locations and rationale will be addressed in the sampling and analysis plans developed before soil-disturbing and vegetation removal activities are conducted (see Section 4.1.5) for nonemergency work. Representativeness will also be achieved through the proper collection

and handling of samples to avoid interferences and minimize contamination and loss (see SOPs 1.1, 2.1, and 9.1 in Appendix I of the RD/RAWP).

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 RD/RAWP).

The completeness goal for samples collected to support future waste management decisions is 90% 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 waste management 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 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 the 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 (UCL) on the mean can be calculated and used for project decisions. The UCL (typically the 95% 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, whereas 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 nonparametric UCL. ProUCL or other software packages for testing goodness-of-fit and calculating the UCL for data sets with and without nondetect 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%

Type II decision error: 20%

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 nonparametric tests such as the Wilcoxon rank sum test are recommended. Nonparametric 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 nonparametric 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. Nonparametric 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 2 and Table 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 and 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 reanalyzed or recollected, if necessary, to meet the 90% 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 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.

Suggestions for improved data collection and statistical evaluation will be provided, as appropriate, for waste management associated with projects subject to this SMP. The project chemist will identify the source of any failure to meet data quality objective performance/acceptance criteria and initiate corrective action, if necessary, to prevent future occurrences.

Table 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(*g,h,i*)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

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

Analyte	Required Detection Limit (µg/kg)	DOE Area
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
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
Dry Wells = Domestic Septic System Dry Wells A–E
Ra/Sr = Radium/Strontium Treatment Systems

6.2.3 Excavated Waste 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 0–10 foot bgs soil horizon can be compared to the site background levels provided in Table 4 to determine the soil's designation. If the concentrations are below site background, the soil can be designated as clean and reused onsite. 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% of uncontaminated soil is statistically expected to contain constituent concentrations above the background levels listed in Table 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 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 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

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

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)
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
General Chemistry			
Hexavalent chromium	NA	NA	1.3
Nitrate	NA	NA	36

Notes:
Soil background concentrations are those established for the DOE areas at LEHR in 2000 (DOE 2000a and 2000b).
[a] Shallow soil background is representative of soil in the 0–4 foot depth interval.
[b] Subsurface soil background is representative of soil deeper than 4 feet bgs and less than or equal to approximately 40 feet bgs.

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.

Contaminant concentrations in removed trees and shrubs may also be compared with the site soil background levels to determine suitability for reuse. If available, trees or shrubs of the same species, of similar size, and in similar condition to those being removed and that are in nearby areas not expected to be contaminated may also be sampled and analyzed for the identified constituents of concern to evaluate background levels. Professional judgement will be used in determining whether trees or shrubs are contaminated.

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 offsite 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 and Vegetation

Clean excavated soil will be reused onsite (such as for fill or other construction purposes), to the extent practicable. Clean vegetation may be chipped and used as ground cover or otherwise processed for reuse. If reuse is not practical or cost-effective, clean waste will be disposed of in a qualifying landfill (see Section 6.3 above).

6.3.2 Nonhazardous Waste

Excavated soil and removed vegetation 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 and vegetation may not have any added radioactivity (i.e., above activities found in background soils). The landfill may require analytical testing of the waste to document that chemical concentrations do not exceed their waste acceptance criteria.

Nonhazardous soil or vegetation may also be reused onsite if a risk assessment can demonstrate that reusing the material 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 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 onsite reuse of contaminated material, 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 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 material to applicable risk-based standards (e.g., EPA Region 9 risk-based screening levels or equivalent). DOE, DTSC, and EPA shall approve the risk assessment before the material may be reused. The material must be reused in accordance with the risk assessment assumptions.

6.3.3 Hazardous, Radioactive, or Mixed Waste

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

Onsite treatment shall be conducted only with agency approval and must meet the requirements of all applicable laws. Onsite treatment may be performed to reduce waste toxicity or consolidate volume prior to disposal. If contaminated soil or vegetation is disposed of at an offsite 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 waste to be shipped offsite 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 and vegetation 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 offsite.

Soil and vegetation with added radioactivity may also be reused onsite if a risk assessment can demonstrate that reusing the material 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 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 material may be reused. All signatories to the ROD will be provided the opportunity to review and comment on the risk assessment. The material must be reused in accordance with the risk assessment assumptions.

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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 or tree/shrub removal 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.

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8.0 Documentation

8.1 Recordkeeping

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

- Work plans
- Analytical data
- Waste designation reports
- Hazardous waste manifests
- Manifest fee documents
- Bills of lading for disposal

8.2 Soil Disturbance Report

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 the following:

- A description of work performed
- A map, with the project location(s) of soil disturbance, soil removal, soil reuse, 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 offsite disposal facilities
- Volumes of soil reused onsite along with surveyed coordinates indicating the location(s) where such soil was placed
- Analytical data for any imported soil placed onsite

8.3 Vegetation Removal Reports

Appendix F provides an inventory of trees and shrubs exceeding 6 feet in height and within, or with canopies extending over, the DOE areas subject to this SMP. This inventory includes a map of tree locations, numerical identifier for each tree, and a table listing the type, size, and condition of each tree or shrub. As shown in this table, approximately 60 trees or shrubs are subject to this SMP:

- Larger trees, including Aleppo pine (19), Canary Island pine (13), Chinese hackberry (6), and white mulberry (1)
- Smaller trees, including almond (4), olive (3), and ash (1)
- Shrubs, including the protected valley elderberry (7) and oleander (6)

A vegetation removal report shall be submitted to the EH&S Unit at the completion of all tree and shrub removal activities. The report shall include all elements of a soil disturbance report, as appropriate, and shall also include an update to the tree/shrub inventory to indicate which trees or shrubs were removed.

8.4 Annual Reports

In accordance with 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.
- A discussion of any soil-disturbing and tree/shrub removal activities and the final disposal of any wastes generated, any violations of the land-use covenant, any action taken to ensure compliance with the land-use covenant, and the updated tree/shrub inventory.

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

8.5 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/vegetation reuse approvals.
- Waste disposal records.
- Incidents and corrective actions.

The results of the audits shall be included in FYRs.

8.6 Five-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 FYR 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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9.0 References

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Appendix A

Recorded Land-Use Covenant

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RECORDING REQUESTED BY:
The Regents of the University of California
c/o Real Estate Services Group
1111 Franklin Street, 6th Floor
Oakland, California 94706-5200
Attention: Director of Real Estate

WHEN RECORDED, MAIL TO:

Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, California 95826
Attention: Charlie Ridenour
Performance Manager, Cleanup Program

Recorded in Official Records,
Solano County
Doc#: 201400051822
7/11/2014 3:11 PM

SPACE ABOVE THIS LINE RESERVED FOR RECORDER'S USE

No Recording Fee pursuant to Government Code 27383

COVENANT TO RESTRICT USE OF PROPERTY

ENVIRONMENTAL RESTRICTION

(Re: Portions of County of Solano Assessor's Parcel No. 110-05-04 UC Davis Laboratory for Energy-related Health Research / Old Campus Landfill (LEHR/OCL) Superfund Site, Site Code 100424)

This Covenant and Agreement ("Covenant") is made by and between the Regents of the University of California, a California public corporation ("University" or the "Covenantor"), the current owner of property situated at the University of California, Davis, County of Solano, State of California, depicted in the attached Exhibit "A" (the "Property"), and the Department of Toxic Substances Control (the "Department"). Pursuant to Civil Code section 1471, the Department has determined that this Covenant is reasonably necessary to protect present or future human health or safety or the environment as a result of the presence on the land of hazardous materials as defined in Health and Safety Code section 25260 in certain portions of the Property. The Covenantor and Department, collectively referred to as the "Parties," hereby agree, pursuant to Civil Code section 1471 and Health and Safety Code section 25355.5, that the use of the Property be restricted as set forth in this Covenant; and the Parties

further agree that the Covenant shall conform with the requirements of California Code of Regulations, title 22, section 67391.1. The provisions of this Covenant shall be for the benefit of, and shall be enforceable by, the United States Environmental Protection Agency ("U.S. EPA") as a third party beneficiary pursuant to general contract law, including, but not limited to, Civil Code Section 1559.

ARTICLE I
STATEMENT OF FACTS

1.01. The former Laboratory for Energy-related Health Research ("LEHR") (*see* Exhibit "A") comprises approximately 15 acres ("LEHR Site" or "Site") in the southern portion of Solano County's Assessor's Parcel No. 110-05-04 (Exhibit "B"). The Property comprises eight distinct areas described and depicted in Exhibit "C" that cover approximately 2.4 acres and lie within the boundary of the LEHR Site (see Exhibit "A"). These eight areas are known as the: 1) Radium/Strontium Treatment System Areas (including Domestic Septic System 2 Area); 2) Domestic Septic System 3 Area; 3) Domestic Septic System 4 Area; 4) Dry Wells A-E Area; 5) Eastern Dog Pens Area; 6) Southwest Trenches Area; 7) Eastern Remediation Support Area; and 8) Western Remediation Support Area. These eight areas correspond to areas 1, 2, 3, 4, 5, 6, 7 and 8 within Exhibit C, respectively, and may be referred to in this Covenant by name or exhibit.

1.02. The LEHR Site was operated by the Atomic Energy Commission (now United States Department of Energy ["DOE"]) as LEHR (referred to as the Radiobiology Laboratory prior to 1979) under a series of Occupancy Agreements with the Regents of the University of California initiated in 1958. The LEHR Site was placed on the National Priorities List by the Environmental Protection Agency on May 31, 1994, 59 Federal Register 27,989. Due to releases of hazardous materials during DOE's occupancy at the Site, DOE and U.S. EPA entered into a Federal Facility Agreement ("FFA") on October 29, 1999, with the Regional Water Quality Control Board and the California Department of Public Health (formerly the California Department of Health Services)

joining as signatories in 1999 and the Department joining in 2000. The intent of the FFA was to ensure that environmental impacts associated with past activities at the LEHR Site are thoroughly investigated, and appropriate response actions taken as necessary to protect human health, welfare, or the environment. Pursuant to the FFA, DOE selected cleanup remedies in the 2009 Record of Decision ("ROD") under the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"). The remedies selected in the ROD require that the Property be subject to land use controls to restrict certain uses, in the form of this Covenant.

1.03. The ROD details the selected remedies for the Property. The Property is restricted because of soil and groundwater contamination, discussed in detail below. For certain areas of the Property, contingent remediation may be necessary if groundwater monitoring indicates that groundwater impacts have occurred pursuant to conditions stated in the ROD. Additionally, a land-use restriction is being imposed at the area described in Exhibit C-6 and depicted on Sheet 2 in Exhibit C. In addition, two areas have been designated for use as staging areas if contingent remediation (*see* section 1.05) is required. These areas are the Eastern Remediation Support Area and Western Remediation Support Area (*see* Exhibits "C-10" and "C-11").

1.04. DOE and the Covenantor ("MOA Parties") entered into a Memorandum of Agreement for environmental restoration and decontamination on March 13, 1990 amended February 17, 1993, November 30, 1993, and again on June 18, 1997, and superseded on July 8, 2009 (referred to collectively as the "MOA"). This MOA outlines the roles and responsibilities of the MOA Parties regarding the investigation and remediation of the LEHR Site. The MOA Parties agree that the required investigation, remediation, long-term surveillance and maintenance, and contingent remediation ("IR & LTSMCR") activities at the Property shall be conducted by DOE.

1.05. Restrictions on soil disturbance apply to six of eight areas of the Property, as identified in Exhibit C-2, Exhibit C-4, Exhibit C-5, Exhibit C-7, Exhibit C-8, and Exhibit C-9. Disturbance of soil is only allowed in compliance with the Soil Management Plan

("SMP") included as an appendix to the Remedial Design/Remedial Action Work Plan dated November 2010, which documents the requirements and methods for implementing remedies selected in the ROD.

The ROD requires groundwater monitoring and this Covenant prohibits interference with the groundwater monitoring wells required for the implementation of the remedies. Groundwater monitoring will be conducted in five of the eight areas of the Property, as identified in Exhibit C-1, Exhibit C-3, Exhibit C-5, Exhibit C-7, and Exhibit C-9 to confirm groundwater protection. If groundwater monitoring indicates that groundwater impacts as defined in the ROD have occurred due to constituents of concern ("COCs") remaining in soil, DOE will evaluate remedial options and determine whether contingent remediation may be required, in accordance with the ROD.

1.06. Land use restrictions listed in section 4.01 are required for the area described in Exhibit C-6 and depicted on Sheet 2 of Exhibit C due to polycyclic aromatic hydrocarbons in the soil, described in more detail below.

1.07. Human Health Risk Assessment. As detailed in the ROD, the Property contains hazardous substances in soil that are defined in Health and Safety Code section 25316 as hazardous substances. Specific COCs that pose a human health risk, and the maximum concentrations detected, are as follows: the Southwest Trenches Area contains strontium-90 (16 picocuries/g); the Eastern Dog Pens Area contains strontium-90 (8.3 picocuries/g) and dieldrin (0.22 mg/kg); and the Domestic Septic System 4 contains benzo(a)anthracene (3.8 mg/kg), benzo(a)pyrene (2.4 mg/kg), benzo(b)fluoranthene (2.7 mg/kg), benzo(k)fluoranthene (1.5 mg/kg), dibenzo (a,h)anthracene (1.1 mg/kg), and indeno(1,2,3-cd)pyrene (1.5 mg/kg).

The human health risk assessment performed by DOE shows COCs present in soil at the Southwest Trenches and Eastern Dog Pen areas are: 1) statistically above background; and 2) present an excess cancer risk above one in one million. The residual contaminants in these areas do not pose a human health risk unless soil containing these contaminants is disturbed, in which case an unacceptable risk to human health or safety or the environment could result. Thus the SMP is required to

prevent such potential risk.

The human health risk assessment performed by DOE shows COCs present in soil at the Domestic Septic System 4 are: 1) statistically above background; and 2) present an excess cancer risk above one in one million and 3) soil exposure and plant ingestion pose a human health risk. Therefore the ROD requires this Covenant restrict the uses as described in section 4.01 and requires compliance with the SMP to prevent an unacceptable risk to human health or safety or the environment.

1.08. Groundwater Protection. As further detailed in the ROD, the Property contains additional hazardous substances in soil that are defined in Health and Safety Code section 25316 as hazardous substances. These residual contaminants present in soil on the Property are a potential risk to groundwater quality.

Specific COCs in soil that are in excess of remediation goals for protection of groundwater are listed in Table 2-8 of the ROD, and are present in the areas of the Property described in Exhibit C-1, Exhibit C-3, Exhibit C-5, Exhibit C-7, and Exhibit C-9 and depicted on survey maps in Exhibit C. These areas contain a variety of COCs that require groundwater monitoring to demonstrate COCs are not migrating to groundwater, and that groundwater protection is maintained in conformance with the groundwater quality goals. Additional COCs listed in Table 2-9 of the ROD are present in the soil in concentrations that do not presently pose a risk to human health or groundwater quality, but may impair groundwater quality in the future. Groundwater monitoring will continue until it can be shown that the COCs in soil no longer pose a threat to water quality.

The human health risk assessment performed by DOE shows that ingestion of groundwater is not the primary risk to human health. However, to protect the groundwater quality, monitoring is required with possible contingent remediation, per the ROD. Based on the human health risk assessment the Department concludes that the Property, as remediated and subject to the restrictions of this Covenant, does not present an unacceptable threat to human health or safety or the environment.

ARTICLE II
DEFINITIONS

2.01. Department. "Department" means the California Department of Toxic Substances Control and includes its successor agencies, if any.

2.02. U.S. EPA. "U.S. EPA" means the United States Environmental Protection Agency and includes its successor agencies, if any.

2.03. Environmental Restrictions. "Environmental Restrictions" means all protective provisions, covenants, restrictions, prohibitions, and terms and conditions as set forth in any section of this Covenant.

2.04. Improvements. "Improvements" includes, but is not limited to: buildings, structures, roads, driveways, improved parking areas, wells, pipelines, or other utilities.

2.05. Lease. "Lease" means lease, rental agreement, or any other document in which the lessor grants to a lessee a right to use or occupy any portion of the Property.

2.06. Occupant. "Occupant" means Owners and any person or entity entitled by ownership, leasehold, or other legal relationship to the right to occupy any portion of the Property.

2.07. Owner. "Owner" means the Covenantor, and all successors in interest including heirs and assigns, who at any time hold title to all or any portion of the Property.

ARTICLE III
GENERAL PROVISIONS

3.01. Runs with the Land. This Covenant sets forth Environmental Restrictions that apply to and encumber the Property and every portion thereof no matter how it is improved, held, used, occupied, leased, sold, hypothecated, encumbered, or conveyed. This Covenant: (a) runs with the land pursuant to Health and Safety Code section 25355.5 and Civil Code section 1471; (b) inures to the benefit of and passes with each and every portion of the Property, (c) is for the benefit of, and is enforceable by the Department, and (d) is imposed upon the entire Property unless expressly stated as applicable only to a specific portion thereof.

3.02. Binding upon Owners/Occupants. Pursuant to the Health and Safety Code, this Covenant binds all owners of the Property, their heirs, successors, and assignees, and the agents, employees, and lessees of the owners, heirs, successors, and assignees. Pursuant to Civil Code section 1471, all successive owners of the Property are expressly bound hereby for the benefit of the Department.

3.03. Incorporation into Deeds and Leases. This Covenant shall be incorporated by reference in each and every deed and lease for any portion of the Property.

3.04. Conveyance of Property. The Owner shall provide written notice to the Department not later than thirty (30) days after any conveyance of any ownership interest in the Property (excluding leases, and mortgages, liens, and other non-possessory encumbrances). The written notice shall include the name and mailing address of the new owner of the Property and shall reference the site name (UC Davis Laboratory for Energy-related Health Research / Old Campus Landfill ("LEHR/OCL") Superfund Site) and site code (100424) as listed on page one of this Covenant. The notice shall also include the Assessor's Parcel Number (APN) (No. 110-05-04) noted on page one. If the new owner's property has been assigned a different APN, each such

APN that covers the Property must be provided. The Department shall not, by reason of this Covenant, have authority to approve, disapprove, or otherwise affect proposed conveyance, except as otherwise provided by law or by administrative order.

3.05. Costs of Administering the Covenant to be paid by Owner. The Department will incur costs associated with the administration of this Covenant. These costs must be paid by the Owner pursuant to California Code of Regulations, title 22, section 67391.1(h). One purpose of the MOA includes delineation of the responsibilities of DOE to cover costs incurred by the Owner associated with implementing and maintaining this Covenant. These costs are currently paid pursuant to the terms of the MOA. If, however, payments are not made pursuant to the MOA, the Owner will be responsible for the Department's costs under this section.

ARTICLE IV
RESTRICTIONS AND REQUIREMENTS

4.01. Prohibited Uses. The area described in Exhibit C-6 and depicted on sheet 2 in Exhibit C shall not be used for any of the following purposes:

(a) A residence, including any mobile home or factory built housing, constructed or installed for use as residential human habitation.

(b) Growing any plants for human consumption.

(c) A day care center for children.

4.02. Soil Management. The following soil management conditions apply to the six areas of the Property described and depicted in Exhibit C-2, Exhibit C-4, Exhibit C-5, and Exhibits C-7 through C-9:

(a) No activities that will disturb soil at or below grade (e.g., excavation, grading, removal, trenching, filling, earth movement, mining, or drilling) shall be allowed in these areas unless abiding by the SMP approved by the U.S. EPA and the Department.

(b) Any contaminated soils brought to the surface by grading, excavation, trenching or backfilling shall be managed in accordance with all applicable provisions of state and federal law.

4.03. Non-Interference with Groundwater Monitoring Wells.

(a) All uses shall preserve the physical accessibility to and integrity of the groundwater monitoring system.

(b) The groundwater monitoring system shall not be altered without prior written approval by the Department.

4.04. Access for Department and the U.S. EPA. The Department shall have reasonable right of entry and access to the Property for inspection, monitoring, and other activities consistent with the purposes of this Covenant as deemed necessary by the Department in order to protect the public health or safety, or the environment. Nothing in this instrument shall limit or otherwise affect U.S. EPA's right of entry and access or U.S. EPA's authority to take response actions under CERCLA; the National Contingency Plan, 40 Code of Federal Regulations Part 300 (1997) and its successor provisions; or federal law. Nothing in this instrument shall limit or otherwise effect the Department's right of entry and access, or authority to take response actions, under CERCLA; the National Contingency Plan, 40 Code of Federal Regulations Part 300 (1997) and its successor provisions; Chapter 6.8, Division 20 of the California Health and Safety Code; California Civil Code, or other applicable state law.

4.05 Access for Implementing Operation and Maintenance. The parties responsible for implementing the operation and maintenance activities shall have reasonable right of entry and access to the Property for the purpose of implementing the operation and maintenance activities until the Department determines that no further operation and maintenance is required.

4.06. Inspection and Reporting Requirements. The Owner shall conduct an

annual inspection of the Property verifying compliance with this Covenant. The annual inspection shall include a verification of permits obtained for any soil-disturbing activities, a review of soil-disturbing activities for compliance with the SMP, a review of disposal practices for waste generated during soil-disturbing activities, and suggested changes to the SMP. The Owner shall submit an annual inspection report to the Department for its approval by January 15th of each year. A copy of the annual inspection report shall also be submitted simultaneously to U.S. EPA. The annual inspection report must include the dates, times, and names of those who conducted the inspection and reviewed the annual inspection report. It also shall describe how the observations were performed that were the basis for the statements and conclusions in the annual inspection report (e.g., drive by, fly over, walk in, etc.). It shall contain the annual inspection results, review of compliance with the requirements of the SMP and certification of compliance with this Covenant, and discussion of any soil-disturbing activities and wastes generated. If violations are noted, the annual inspection report must detail the steps taken to return to compliance. If the Owner identifies any violations of this Covenant during the annual inspections or at any other time, the Owner must within ten (10) days of identifying the violation: determine the identity of the party in violation, send a letter advising the party of the violation of the Covenant, and demand that the violation ceases immediately. Additionally, copies of any correspondence related to the violation of this Covenant shall be sent to the Department and U.S. EPA within ten (10) days of its original transmission.

ARTICLE V
ENFORCEMENT

5.01. Enforcement. Failure of the Owner or Occupant to comply with this Covenant shall be grounds for the Department to require modification or removal of any Improvements constructed or placed upon any portion of the Property in violation of this Covenant. Violation of this Covenant, including but not limited to, failure to submit, or the submission of any false statement, record or report to the Department, shall be grounds for the Department to pursue administrative, civil, or criminal actions, as

provided by law.

5.02. Enforcement Rights of U.S. EPA as a Third Party Beneficiary. U.S. EPA, as a third party beneficiary, has the right to enforce the Environmental Restrictions contained herein.

ARTICLE VI
VARIANCE, REMOVAL, AND TERM

6.01. Variance. Any person may apply to the Department for a written variance from the provisions of this Covenant. Such application shall be made in accordance with Health and Safety Code section 25223 and a copy of the application shall be submitted to U.S. EPA simultaneously with the application submitted to the Department. No variance may be granted under this paragraph without prior notice to and an opportunity to comment by U.S. EPA.

6.02 Removal. Any person may apply to the Department to remove any or all restrictions imposed by this Covenant. Such application shall be made in accordance with Health and Safety Code section 25224 and a copy of the application shall be submitted to U.S. EPA simultaneously with the application submitted to the Department. No modifications may be granted under this paragraph without prior notice to and an opportunity to comment by U.S. EPA.

6.03 Term. Unless ended in accordance with paragraph 6.02, by law, or by the Department in the exercise of its discretion, after providing notice to and an opportunity to comment by U.S. EPA, this Covenant shall continue in effect in perpetuity.

ARTICLE VII
MISCELLANEOUS

7.01. No Dedication Intended. Nothing set forth in this Covenant shall be

construed to be a gift or dedication, or offer of a gift or dedication, of the Property, or any portion thereof to the general public or anyone else for any purpose whatsoever. Further, nothing set forth in this Covenant shall be construed to affect a taking under State or Federal law.

7.02. Recordation. The Covenantor shall record this Covenant, with all referenced Exhibits, in the County of Solano within ten (10) days of the Covenantor's receipt of a fully executed original.

7.03. Notices. Whenever any person gives or serves any Notice ("Notice" as used herein includes any demand or other communication with respect to this Covenant), each such Notice shall be in writing and shall be deemed effective: when delivered, if personally delivered to the person being served or to an officer of a corporate party being served, or three (3) business days after deposit in the mail, if mailed by United States mail, postage paid, certified, return receipt requested:

primary:	Environmental Manager Environmental Health and Safety University of California, Davis, One Shields Avenue Davis, California, 95616
with copies to:	The Regents of the University of California c/o Real Estate Services Group 1111 Franklin Street, 6th, Floor Oakland, California 94530 Attention: Director of Real Estate
and:	Real Estate Services University of California, Davis 255 Cousteau Place

Davis, California 95618
Attn: Executive Director

and to Department: Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, California 95826
Attention: Performance Manager, Cleanup Program

and to U.S.EPA: U.S. Environmental Protection Agency
Superfund Program
Region IX
75 Hawthorne Street
San Francisco, CA 94105-3901
Attn: LEHR Remedial Project Manager

Any party may change its address or the individual to whose attention a Notice is to be sent by giving written Notice in compliance with this paragraph.

7.04. Partial Invalidity. If this Covenant or any of its terms are determined by a court of competent jurisdiction to be invalid for any reason, the surviving portions of this Covenant shall remain in full force and effect as if such portion found invalid had not been included herein.

7.05. Statutory References. All statutory or regulatory references include successor provisions.

7.06. Incorporation of Exhibits. All attachments and exhibits to this Covenant are incorporated herein by reference.

IN WITNESS WHEREOF, the Parties execute this Covenant.

Covenantor: The Regents of the University of California, a California public corporation

By: _____

Title: Anne L. Shaw, Interim Secretary and Chief of Staff to The Regents of the University of California

Date: 7/8/14

APPROVED AS TO FORM

Date: 7/1/14 _____
Kelly L. Drumm

Department of Toxic Substances Control:

By: _____

Title: Charlie Ridenour, Branch Chief, Cleanup Program, Sacramento Office

Date: 3/3/2014

See loose California All-Purpose Acknowledgement

State of California

County of Alameda

On July 8, 2014 before me,

Drue M'Carthy, Notary Public

(space above this line is for name and title of the officer/notary),

personally appeared Anne L Shaw, who proved to me on the basis of satisfactory evidence to be the person~~(s)~~ whose name~~(s)~~ is/~~are~~ subscribed to the within instrument and acknowledged to me that ~~he~~/she/~~they~~ executed the same in ~~his~~/her/~~their~~ authorized capacity~~(ies)~~, and that by ~~his~~/her/~~their~~ signature~~(s)~~ on the instrument the person~~(s)~~, or the entity upon behalf of which the person~~(s)~~ acted, executed the instrument. I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal,

DRUE MCCARTHY
COMM # 1966988
ALAMEDA COUNTY
NOTARY PUBLIC-CALIFORNIA
MY COMMISSION EXPIRES
JAN. 21, 2016

Dane M'Carthy (seal)
Signature of Notary Public

California All-Purpose Acknowledgement

State of California
County of Sacramento

On March 3, 2014 before me,

Theresa M. Vigil, Notary Public,
(space above this line is for name and title of ~~the~~ officer/notary),

personally appeared Charlie Ridenour, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity(~~ies~~), and that by his/~~her/their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument. I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal,

THERESA M. VIGIL
Commission # 1962796
Notary Public - California
Sacramento County
My Comm. Expires Dec 5, 2015

Theresa M. Vigil (seal)
Signature of Notary Public

THERESA M. VIGIL
Commission # 1962796
Notary Public - California
Sacramento County
My Comm. Expires Dec 5, 2015

EXHIBIT A

Map of Property Subject to Environmental Restrictions

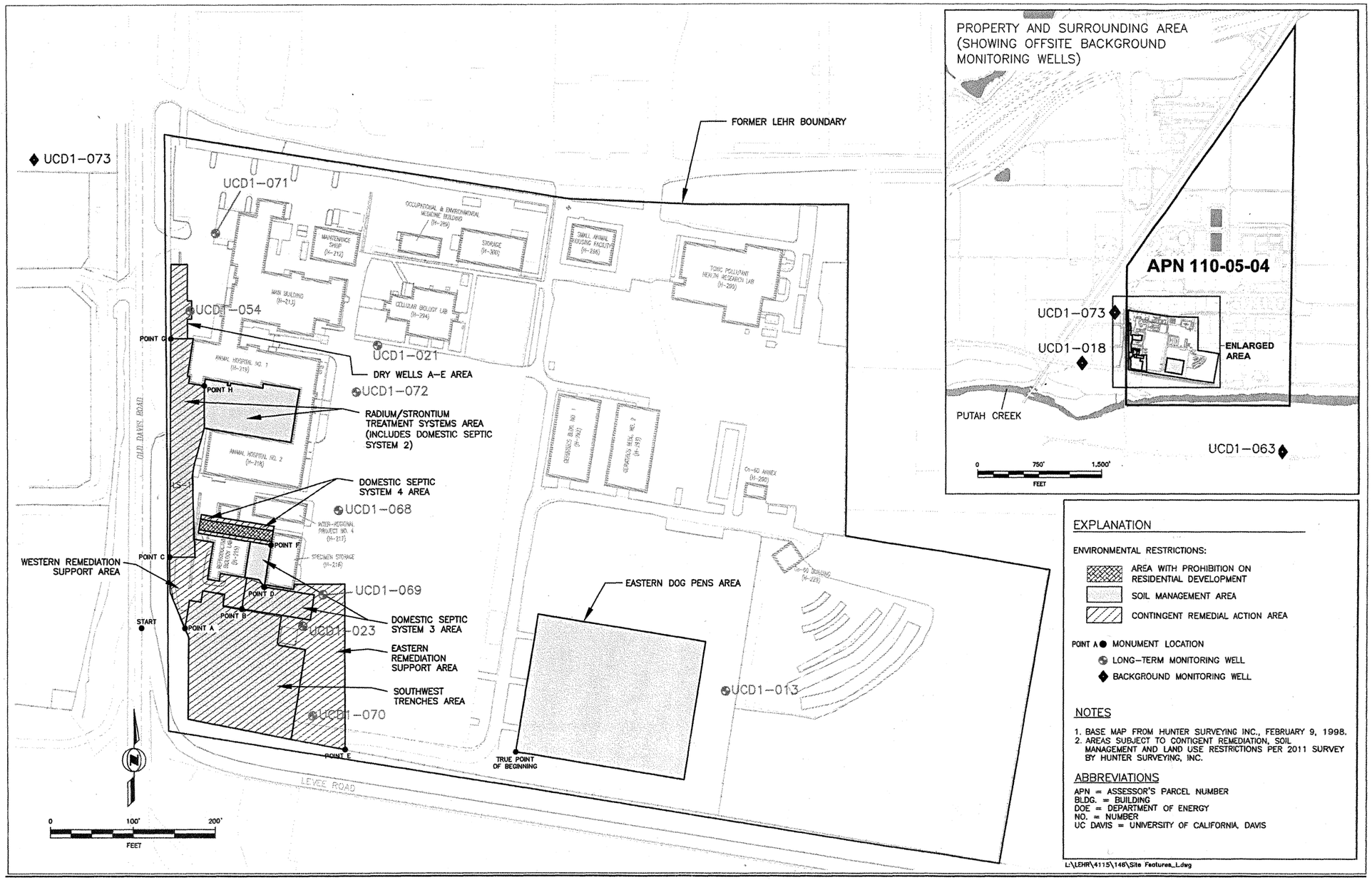


Exhibit B

Description of Assessor's Parcel, Portions of which are Subject to Environmental Restrictions

All that certain real property situated in Solano County, California described as follows:

Solano County Assessor's Parcel Number 110-05-04 more particularly described in Quitclaim Deed recorded May 18, 1999, as Document No 1999-00042875 Official Records of said county, that includes Exhibit A comprising *Description - Hamel to UCD* and *Quitclaim Line Exhibit* prepared by Frame Surveying & Mapping,

and

shown on the attached map of parcel 110-05-04.

EXHIBIT B.1

Map of Parcel Number 110-050-04

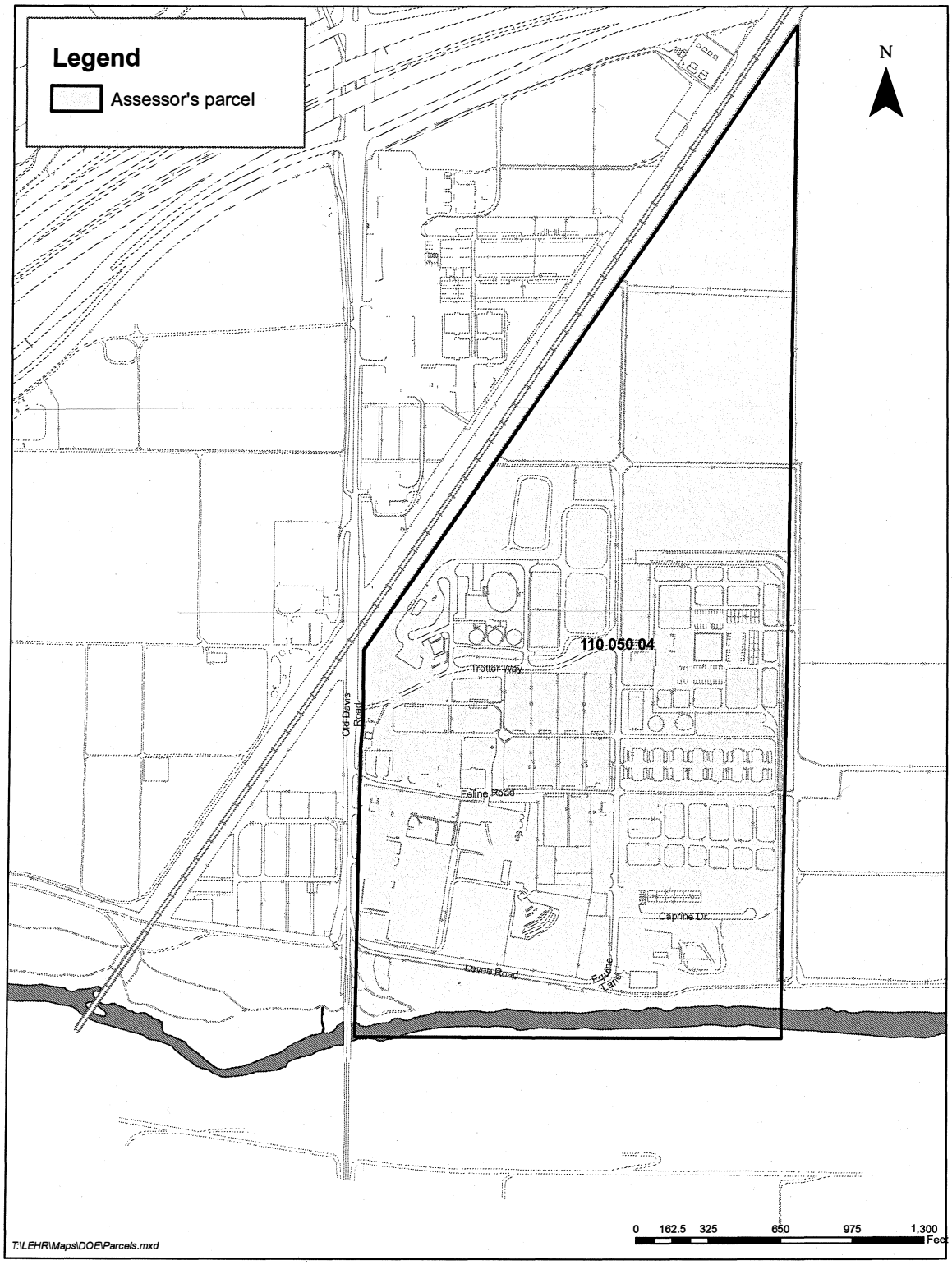


EXHIBIT C

Legal Descriptions of Areas Subject to Specific Environmental Restrictions

1. Radium / Strontium Treatment Systems Area

Exhibit C-1 Radium / Strontium Treatment Systems Area Subject to Contingent Remediation

Exhibit C-2 Radium / Strontium Treatment Systems Area Subject to Soil Management Plan

Survey Map Sheet 3 of 4

2. Domestic Septic System 3 Area

Exhibit C-3 Domestic Septic System 3 Area Subject to Contingent Remediation

Exhibit C-4 Domestic Septic System 3 Area Subject to Soil Management Plan

Survey Map Sheets 1 of 4 and 2 of 4

3. Domestic Septic System 4 Area

Exhibit C-5 Domestic Septic System 4 Area Subject to Contingent Remediation and Soil Management Plan

Exhibit C-6 Domestic Septic System 4 Area Subject to Restrictions on Land Use

Survey Map Sheets 1 of 4 and 2 of 4

4. Dry Wells A-E Area

Exhibit C-7 Dry Wells A-E Area Subject to Contingent Remediation and Soil Management Plan

Survey Map Sheet 3 of 4

5. Eastern Dog Pens Area

Exhibit C-8 Eastern Dog Pens Area Subject to Soil Management Plan

Survey Map Sheet 4 of 4

6. Southwest Trenches Area

Exhibit C-9 Southwest Trenches Area Subject to Contingent Remediation and Soil Management Plan

Survey Map Sheet 1 of 4

7. Eastern Remediation Support Area

Exhibit C-10 Eastern Remediation Support Area

Survey Map Sheet 1 of 4

8. Western Remediation Support Are

Exhibit C-11 Western Remediation Support Area

Survey Map Sheet 1 of 4

SURVEY MAPS

Site Map of Areas Subject to Specific Environmental Restrictions (pages 1 through 4)

COVENANT DESCRIPTION – EXHIBIT C-1

RADIUM / STRONTIUM TREATMENT SYSTEMS AREA
SUBJECT TO CONTINGENT REMEDIATION

All that portion of Lot 37 Rancho Los Putos and projected Section 21, T.8N., R.2E., M.D.B. & M., County of Solano, State of California, being a portion of that certain real property described in Quitclaim Deed recorded May 18, 1999, as Document No. 1999-00042875 Official Records of said county, described as follows:

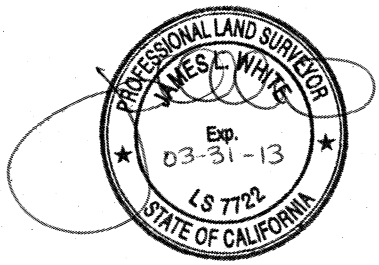
Commencing at a point in the centerline of Old Davis Road (County Road No. 79) marked by a found aluminum cap monument stamped "Solano County Surveyor", from which a found 1 1/2" brass cap in monument well, accepted as marking the intersection of Becker Road (County Road Nos. 86 and 106) and said Old Davis Road (County Road No. 79), bears S 00°22'36" W 8421.14 feet (cited in said Quitclaim Deed as S 00°23'11" W);

thence along said centerline S 00°22'36" W 2693.84 feet; thence at right angles from said centerline S 89°37'24" E 52.85 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point A***, thence N 22°43'48" W 46.75 feet; thence N 04°18'15" W 8.57 feet; thence N 00°10'20" W 34.24 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point C***, and the **True Point of Beginning**;

thence N 00°25'23" E 263.54 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point G***; thence East 20.30 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence continuing East 7.01 feet to the northwest corner of Building H-219; thence along the westerly and southerly lines of Building H-219 the following four courses: S 09°11'25" W 45.72 feet, S 80°48'35" E 2.99 feet, S 09°11'25" W 8.40 feet, and S 80°48'35" E 19.33 feet to a point, called ***Point H***; thence leaving Building H-219 South 50.67 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence S 16°02'47" W 45.75 feet; thence S 09°20'34" W 14.76 feet; thence S 01°59'38" E 97.40 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence West 31.00 feet to the true point of beginning.

Containing 8244.44 square feet (0.189 acres), more or less.

The foregoing description is based on the bearing between found UC Davis Control Monuments 620 to 666 as being S 81°32'47" E.



COVENANT DESCRIPTION – EXHIBIT C-2

RADIUM / STRONTIUM TREATMENT SYSTEMS AREA
SUBJECT TO SOIL MANAGEMENT PLAN

All that portion of Lot 37 Rancho Los Putos and projected Section 21, T.8N., R.2E., M.D.B.&M., County of Solano, State of California, being a portion of that certain real property described in Quitclaim Deed recorded May 18, 1999, as Document No. 1999-00042875 Official Records of said county, described as follows:

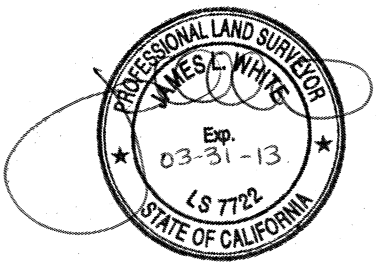
Commencing at a point in the centerline of Old Davis Road (County Road No. 79) marked by a found aluminum cap monument stamped "Solano County Surveyor", from which a found 1 1/2" brass cap in monument well, accepted as marking the intersection of Becker Road (County Road Nos. 86 and 106) and said Old Davis Road (County Road No. 79), bears S 00°22'36" W 8421.14 feet (cited in said Quitclaim Deed as S 00°23'11" W);

thence along said centerline S 00°22'36" W 2693.84 feet; thence at right angles from said centerline S 89°37'24" E 52.85 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point A***, thence N 22°43'48" W 46.75 feet; thence N 04°18'15" W 8.57 feet; thence N 00°10'20" W 34.24 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point C***, and the **True Point of Beginning**;

thence N 00°25'23" E 263.54 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point G***; thence East 20.30 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence continuing East 7.01 feet to the northwest corner of Building H-219; thence along the westerly and southerly lines of Building H-219 the following four courses: S 09°11'25" W 45.72 feet, S 80°48'35" E 2.99 feet, S 09°11'25" W 8.40 feet, and S 80°48'35" E 19.33 feet to a point, called ***Point H***; thence continuing along the southerly line of Building H-219 the following eight courses: N 09°11'25" E 8.40 feet, S 80°48'35" E 28.34 feet, S 09°11'25" W 3.34 feet, S 80°48'35" E 3.58 feet, N 09°11'25" E 3.34 feet, S 80°48'35" E 39.23 feet, N 09°11'25" E 5.54 feet, and S 80°48'35" E 44.41 feet; thence S 09°11'25" W along the west line of the building transition of Building H-219 to H-218 a distance of 64.27 feet; thence along the north line of Building H-218 N 80°48'35" W 99.92 feet to the northwest corner of Building H-218; thence leaving said Building H-218 N 78°25'56" W 7.54 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", from which hereinabove described Point H bears North 50.67 feet; thence S 16°02'47" W 45.75 feet; thence S 09°20'34" W 14.76 feet; thence S 01°59'38" E 97.40 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence West 31.00 feet to the true point of beginning.

Containing 15058.50 square feet (0.346 acres), more or less.

The foregoing description is based on the bearing between found UC Davis Control Monuments 620 to 666 as being S 81°32'47" E.



COVENANT DESCRIPTION – EXHIBIT C-3

DOMESTIC SEPTIC SYSTEM 3 AREA
SUBJECT TO CONTINGENT REMEDIATION

All that portion of Lot 37 Rancho Los Putos and projected Section 21, T.8N., R.2E., M.D.B. & M., County of Solano, State of California, being a portion of that certain real property described in Quitclaim Deed recorded May 18, 1999, as Document No. 1999-00042875 Official Records of said county, described as follows:

Commencing at a point in the centerline of Old Davis Road (County Road No. 79) marked by a found aluminum cap monument stamped "Solano County Surveyor," from which a found 1 1/2" brass cap in monument well, accepted as marking the intersection of Becker Road (County Road Nos. 86 and 106) and said Old Davis Road (County Road No. 79), bears S 00°22'36" W 8421.14 feet (cited in said Quitclaim Deed as S 00°23'11" W);

thence along said centerline S 00°22'36" W 2693.84 feet; thence at right angles from said centerline S 89°37'24" E 52.85 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point A***; thence N 71°27'11" E 73.26 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point B***, and the **True Point of Beginning**;

thence N 09°11'25" E 37.90 feet; thence S 80°48'35" E 15.49 feet; thence S 35°48'35" E 10.47 feet to a point, called ***Point D***, from which hereinabove described Point B bears S 46°04'44" W 38.13 feet; thence S 80°48'35" E 61.76 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence S 09°11'25" W 30.50 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence N 80°48'35" W 35.00 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence N 80°48'35" W 49.65 feet to the true point of beginning.

Containing 2723.84 square feet (0.063 acres), more or less.

The foregoing description is based on the bearing between found UC Davis Control Monuments 620 to 666 as being S 81°32'47" E.

COVENANT DESCRIPTION – EXHIBIT C-4

DOMESTIC SEPTIC SYSTEM 3 AREA
SUBJECT TO SOIL MANAGEMENT PLAN

All that portion of Lot 37 Rancho Los Putos and projected Section 21, T.8N., R.2E., M.D.B. & M., County of Solano, State of California, being a portion of that certain real property described in Quitclaim Deed recorded May 18, 1999, as Document No. 1999-00042875 Official Records of said county, described as follows:

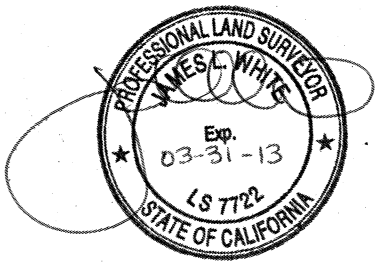
Commencing at a point in the centerline of Old Davis Road (County Road No. 79) marked by a found aluminum cap monument stamped "Solano County Surveyor," from which a found 1 1/2" brass cap in monument well, accepted as marking the intersection of Becker Road (County Road Nos. 86 and 106) and said Old Davis Road (County Road No. 79), bears S 00°22'36" W 8421.14 feet (cited in said Quitclaim Deed as S 00°23'11" W);

thence along said centerline S 00°22'36" W 2693.84 feet; thence at right angles from said centerline S 89°37'24" E 52.85 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point A***; thence N 71°27'11" E 73.26 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point B***, and the **True Point of Beginning**;

thence N 09°11'25" E 37.90 feet; thence N 80°48'35" W 2.55 feet to the southerly terminus of the east line of Building H-215; thence along said east line of Building H-215 N 09°11'25" E 43.91 feet; thence leaving said east line S 80°48'35" E 25.44 feet to a point in the west line of Building H-216, called **Point F**; thence along said west line of Building H-216 S 09°11'25" W 48.55 feet to the southwest corner of Building H-216; thence leaving said building and continuing S 09°11'25" W 2.77 feet to a point, called ***Point D***, from which hereinabove described Point B bears S 46°04'44" W 38.13 feet; thence S 80°48'35" E 61.76 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence S 09°11'25" W 30.50 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence N 80°48'35" W 35.00 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence continuing N 80°48'35" W 49.65 feet to the true point of beginning.

Containing 3868.27 square feet (0.089 acres), more or less.

The foregoing description is based on the bearing between found UC Davis Control Monuments 620 to 666 as being S 81°32'47" E.



COVENANT DESCRIPTION – EXHIBIT C-5

DOMESTIC SEPTIC SYSTEM 4 AREA

SUBJECT TO CONTINGENT REMEDIATION AND SOIL MANAGEMENT PLAN

All that portion of Lot 37 Rancho Los Putos and projected Section 21, T.8N., R.2E., M.D.B. & M., County of Solano, State of California, being a portion of that certain real property described in Quitclaim Deed recorded May 18, 1999, as Document No. 1999-00042875 Official Records of said county, described as follows:

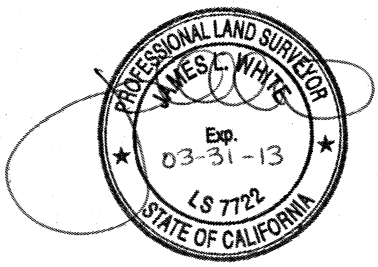
Commencing at a point in the centerline of Old Davis Road (County Road No. 79) marked by a found aluminum cap monument stamped "Solano County Surveyor," from which a found 1 1/2" brass cap in monument well, accepted as marking the intersection of Becker Road (County Road Nos. 86 and 106) and said Old Davis Road (County Road No. 79), bears S 00°22'36" W 8421.14 feet (cited in said Quitclaim Deed as S 00°23'11" W);

thence along said centerline S 00°22'36" W 2693.84 feet; thence at right angles from said centerline S 89°37'24" E 52.85 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point A***; thence N 71°27'11" E 73.26 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point B***; thence N 46°04'44" E 38.13 feet to a point called ***Point D***; thence N 09°11'25" E 2.77 feet to the southwest corner of Building H-216; thence along the west line of said building N 09°11'25" E 48.55 feet to a point, called ***Point F***, and the **True Point of Beginning**;

thence leaving said west building line N 80°48'35" W 25.44 feet to a point in the east line of Building H-215; thence continuing N 80°48'35" W through Building H-215 a distance of 53.37 feet to a point on the west line of Building H-215; thence continuing N 80°48'35" W 11.19 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence N 09°11'25" E 22.85 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence S 80°48'35" E 19.77 feet to a point on the west line of Building H-215; thence continuing S 80°48'35" E through Building H-215 a distance of 44.79 feet to the most east corner of said Building H-215; thence continuing S 80°48'35" E 25.44 feet; thence along the west line of Building H-216 and its northerly projection S 09°11'25" W 22.85 feet to the true point of beginning.

Containing 2056.50 square feet (0.047 acres), more or less.

The foregoing description is based on the bearing between found UC Davis Control Monuments 620 to 666 as being S 81°32'47" E.



COVENANT DESCRIPTION – EXHIBIT C-6

DOMESTIC SEPTIC SYSTEM 4 AREA
SUBJECT TO RESTRICTION ON LAND USE

All that portion of Lot 37 Rancho Los Putos and projected Section 21, T.8N., R.2E., M.D.B. & M., County of Solano, State of California, being a portion of that certain real property described in Quitclaim Deed recorded May 18, 1999, as Document No. 1999-00042875 Official Records of said county, described as follows:

Commencing at a point in the centerline of Old Davis Road (County Road No. 79) marked by a found aluminum cap monument stamped "Solano County Surveyor," from which a found 1 1/2" brass cap in monument well, accepted as marking the intersection of Becker Road (County Road Nos. 86 and 106) and said Old Davis Road (County Road No. 79), bears S 00°22'36" W 8421.14 feet (cited in said Quitclaim Deed as S 00°23'11" W);

thence along said centerline S 00°22'36" W 2693.84 feet; thence at right angles from said centerline S 89°37'24" E 52.85 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point A***; thence N 71°27'11" E 73.26 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point B***; thence N 46°04'44" E 38.13 feet to a point, called ***Point D***; thence N 09°11'25" E 2.77 feet to the southwest corner of Building H-216; thence along the west line of said building N 09°11'25" E 48.55 feet to a point, called ***Point F***; thence continuing along said west building line N 09°11'25" E 4.29 feet to the **True Point of Beginning**;

thence leaving said west building line N 80°48'35" W 25.44 feet to a point in the east line of Building H-215; thence continuing N 80°48'35" W through Building H-215 a distance of 53.37 feet to a point on the west line of Building H-215; thence continuing N 80°48'35" W 11.19 feet to a point, from which a 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE" bears S 09°11'25" W 4.29 feet; thence N 09°11'25" E 13.00 feet to a point, from which a 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE" bears N 09°11'25" E 5.56 feet; thence S 80°48'35" E 19.77 feet to a point on the west line of Building H-215; thence continuing S 80°48'35" E through Building H-215 a distance of 44.79 feet to a point on the east line of said Building H-215; thence continuing S 80°48'35" E 25.44 feet; thence along the west line of Building H-216 and its northerly projection S 09°11'25" W 13.00 feet to the true point of beginning.

Containing 1170.00 square feet (0.027 acres), more or less.

The foregoing description is based on the bearing between found UC Davis Control Monuments 620 to 666 as being S 81°32'47" E.

COVENANT DESCRIPTION – EXHIBIT C-7

DRY WELLS A-E AREA

SUBJECT TO CONTINGENT REMEDIATION AND SOIL MANAGEMENT PLAN

All that portion of Lot 37 Rancho Los Putos and projected Section 21, T.8N., R.2E., M.D.B. & M., County of Solano, State of California, being a portion of that certain real property described in Quitclaim Deed recorded May 18, 1999, as Document No. 1999-00042875 Official Records of said county, described as follows:

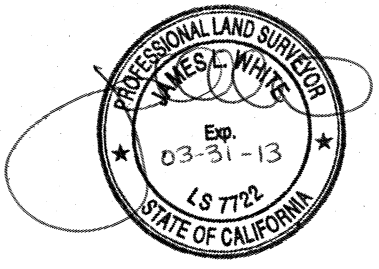
Commencing at a point in the centerline of Old Davis Road (County Road No. 79) marked by a found aluminum cap monument stamped "Solano County Surveyor", from which a found 1 1/2" brass cap in monument well, accepted as marking the intersection of Becker Road (County Road Nos. 86 and 106) and said Old Davis Road (County Road No. 79), bears S 00°22'36" W 8421.14 feet (cited in said Quitclaim Deed as S 00°23'11" W);

thence along said centerline S 00°22'36" W 2693.84 feet; thence at right angles from said centerline S 89°37'24" E 52.85 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point A***, thence N 22°43'48" W 46.75 feet; thence N 04°18'15" W 8.57 feet; thence N 00°10'20" W 34.24 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point C***; thence N 00°25'23" E 263.54 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point G***, and the **True Point of Beginning**;

thence East 20.30 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence North 23.47 feet; thence East 5.20 feet; thence North 22.00 feet; thence West 5.20 feet; thence North 44.00 feet; thence West 20.00 feet; thence S 00°11'32" W 89.47 feet to the true point of beginning.

Containing 1917.19 square feet (0.044 acres), more or less.

The foregoing description is based on the bearing between found UC Davis Control Monuments 620 to 666 as being S 81°32'47" E.



COVENANT DESCRIPTION – EXHIBIT C-8

EASTERN DOG PENS AREA
SUBJECT TO SOIL MANAGEMENT PLAN

All that portion of Lot 37 Rancho Los Putos and projected Section 21, T.8N., R.2E., M.D.B. & M., County of Solano, State of California, being a portion of that certain real property described in Quitclaim Deed recorded May 18, 1999, as Document No. 1999-00042875 Official Records of said county, described as follows:

Commencing at a point in the centerline of Old Davis Road (County Road No. 79) marked by a found aluminum cap monument stamped "Solano County Surveyor," from which a found 1 1/2" brass cap in monument well, accepted as marking the intersection of Becker Road (County Road Nos. 86 and 106) and said Old Davis Road (County Road No. 79), bears S 00°22'36" W 8421.14 feet (cited in said Quitclaim Deed as S 00°23'11" W);

thence along said centerline S 00°22'36" W 2693.84 feet; thence at right angles from said centerline S 89°37'24" E 52.85 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point A***; thence S 53°01'21" E 243.86 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point E***; thence S 89°07'50" E 207.70 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE" and the **True Point of Beginning**;

thence N 09°15'00" E 168.30 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence S 80°45'00" E 207.80 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence S 09°15'00" W 168.30 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence N 80°45'00" W 207.80 feet to the true point of beginning.

Containing 34972.74 square feet (0.803 acres), more or less.

The foregoing description is based on the bearing between found UC Davis Control Monuments 620 to 666 as being S 81°32'47" E.

COVENANT DESCRIPTION – EXHIBIT C-9

SOUTHWEST TRENCHES AREA

SUBJECT TO CONTINGENT REMEDIATION AND SOIL MANAGEMENT PLAN

All that portion of Lot 37 Rancho Los Putos and projected Section 21, T.8N., R.2E., M.D.B. & M., County of Solano, State of California, being a portion of that certain real property described in Quitclaim Deed recorded May 18, 1999, as Document No. 1999-00042875 Official Records of said county, described as follows:

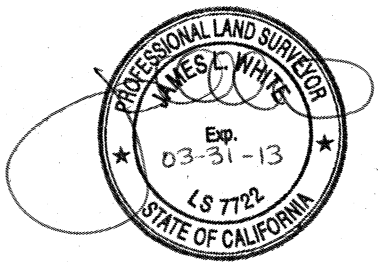
Commencing at a point in the centerline of Old Davis Road (County Road No. 79) marked by a found aluminum cap monument stamped "Solano County Surveyor," from which a found 1 1/2" brass cap in monument well, accepted as marking the intersection of Becker Road (County Road Nos. 86 and 106) and said Old Davis Road (County Road No. 79), bears S 00°22'36" W 8421.14 feet (cited in said Quitclaim Deed as S 00°23'11" W);

thence along said centerline S 00°22'36" W 2693.84 feet; thence at right angles from said centerline S 89°37'24" E 52.85 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point A***, and the **True Point of Beginning**;

thence N 09°11'25" E 34.10 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence S 80°48'35" E 14.25 feet; thence N 09°11'25" E 14.00 feet; thence S 80°48'35" E 27.50 feet; thence S 09°11'25" W 14.00 feet; thence S 80°48'35" E 23.09 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point B***, from which hereinabove described *Point A* bears S 71°27'11" W 73.26 feet; thence S 80°48'35" E 49.65 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence S09°11'25" W 33.70 feet; thence S 35°48'35" E 3.54 feet; thence S 80°48'35" E 32.50 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence S 09°11'25" W 109.80 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence N 78°55'32" W 128.40 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence N 00°27'10" E 98.48 feet; thence N 21°45'41" W 12.06 feet to the true point of beginning.

Containing 19222.27 square feet (0.441 acres), more or less.

The foregoing description is based on the bearing between found UC Davis Control Monuments 620 to 666 as being S 81°32'47" E.



COVENANT DESCRIPTION – EXHIBIT C-10

EASTERN REMEDIATION SUPPORT AREA

All that portion of Lot 37 Rancho Los Putos and projected Section 21, T.8N., R.2E., M.D.B. & M., County of Solano, State of California, being a portion of that certain real property described in Quitclaim Deed recorded May 18, 1999, as Document No. 1999-00042875 Official Records of said county, described as follows:

Commencing at a point in the centerline of Old Davis Road (County Road No. 79) marked by a found aluminum cap monument stamped "Solano County Surveyor," from which a found 1 1/2" brass cap in monument well, accepted as marking the intersection of Becker Road (County Road Nos. 86 and 106) and said Old Davis Road (County Road No. 79), bears S 00°22'36" W 8421.14 feet (cited in said Quitclaim Deed as S 00°23'11" W);

thence along said centerline S 00°22'36" W 2693.84 feet; thence at right angles from said centerline S 89°37'24" E 52.85 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point A***; thence N 71°27'11" E 73.26 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point B***; thence N 46°04'44" E 38.13 feet to a point, called ***Point D***, and the **True Point of Beginning**;

thence S 80°48'35" E 61.76 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence S 09°11'25" W 30.50 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence N 80°48'35" W 35.00 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence S 09°11'25" W 33.70 feet; thence S 35°48'35" E 3.54 feet; thence S 80°48'35" E 32.50 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence S 09°11'25" W 109.80 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence S 79°15'54" E 66.27 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point E***, from which hereinabove described Point A bears N 53°01'21" W 243.86 feet; thence North 199.46 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence West 60.80 feet to a point in east line of Building H-216; thence along said building S 09°11'25" W 6.14 feet to the southeast corner of said building; thence along the south line of said building N 80°48'35" W 36.14 to the southwest corner of said building; thence leaving said building line S 09°11'25" W 2.77 feet to the true point of beginning.

Containing 11398.47 square feet (0.262 acres), more or less.

The foregoing description is based on the bearing between found UC Davis Control Monuments 620 to 666 as being S 81°32'47" E.

COVENANT DESCRIPTION – EXHIBIT C-11

WESTERN REMEDIATION SUPPORT AREA

All that portion of Lot 37 Rancho Los Putos and projected Section 21, T.8N., R.2E., M.D.B. & M., County of Solano, State of California, being a portion of that certain real property described in Quitclaim Deed recorded May 18, 1999, as Document No. 1999-00042875 Official Records of said county, described as follows:

Commencing at a point in the centerline of Old Davis Road (County Road No. 79) marked by a found aluminum cap monument stamped "Solano County Surveyor", from which a found 1 1/2" brass cap in monument well, accepted as marking the intersection of Becker Road (County Road Nos. 86 and 106) and said Old Davis Road (County Road No. 79), bears S 00°22'36" W 8421.14 feet (cited in said Quitclaim Deed as S 00°23'11" W);

thence along said centerline S 00°22'36" W 2693.84 feet; thence at right angles from said centerline S 89°37'24" E 52.85 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point A***, and the **True Point of Beginning**;

thence N 09°11'25" E 34.10 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence S 80°48'35" E 14.25 feet; thence N 09°11'25" E 14.00 feet; thence S 80°48'35" E 27.50 feet; thence S 09°11'25" W 14.00 feet; thence S 80°48'35" E 23.09 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point B***, from which hereinabove described *Point A* bears S 71°27'11" W 73.26 feet; thence N 09°11'25" E 37.90 feet; thence N 80°48'35" W 2.55 feet to the southerly terminus of the east line of Building H-215; thence along said Building H-215 the following four courses: N 80°48'35" W 30.01 feet, S 09°11'25" W 9.34 feet, N 80°48'35" W 14.69 feet and N 09°11'25" E 45.30 feet; thence leaving said Building H-215, N 80°45'35" W 23.47 feet; thence S 01°59'38" E 21.62 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE"; thence West 31.00 feet to a set 5/8" rebar with 2" brass cap, stamped "CERCLA Land Use Control – US DOE", called ***Point C***; thence S 00°10'20" E 34.24 feet; thence S 04°18'15" E 8.57 feet; thence S 22°43'48" E 46.75 feet to the true point of beginning.

Containing 4433.49 square feet (0.102 acres), more or less.

The foregoing description is based on the bearing between found UC Davis Control Monuments 620 to 666 as being S 81°32'47" E.

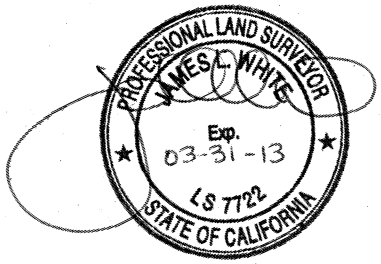


EXHIBIT C

Survey Maps of Areas Subject to Specific Environmental Restrictions

Survey Map Sheet 1 of 4

- Domestic Septic System 3 Area Subject to Contingent Remediation (Exhibit C-3)*
- Domestic Septic System 3 Area Subject to Soil Management Plan (Exhibit C-4)
- Southwest Trenches Area Subject to Contingent Remediation and Soil Management Plan (Exhibit C-9)
- Eastern Remediation Support Area (Exhibit C-10)
- Western Remediation Support Area (Exhibit C-11)

Survey Map Sheet 2 of 4

- Radium/Strontium Treatment Systems Area Subject to Contingent Remediation (Exhibit C-1)
- Domestic Septic System 3 Area Subject to Contingent Remediation (Exhibit C-3)
- Domestic Septic System 3 Area Subject to Soil Management Plan (Exhibit C-4)
- Domestic Septic System 4 Area Subject to Contingent Remediation and Soil Management Plan (Exhibit C-5)
- Domestic Septic System 4 Area Subject to Restrictions on Land Use (Exhibit C-6)
- Western Remediation Support Area (Exhibit C-11)

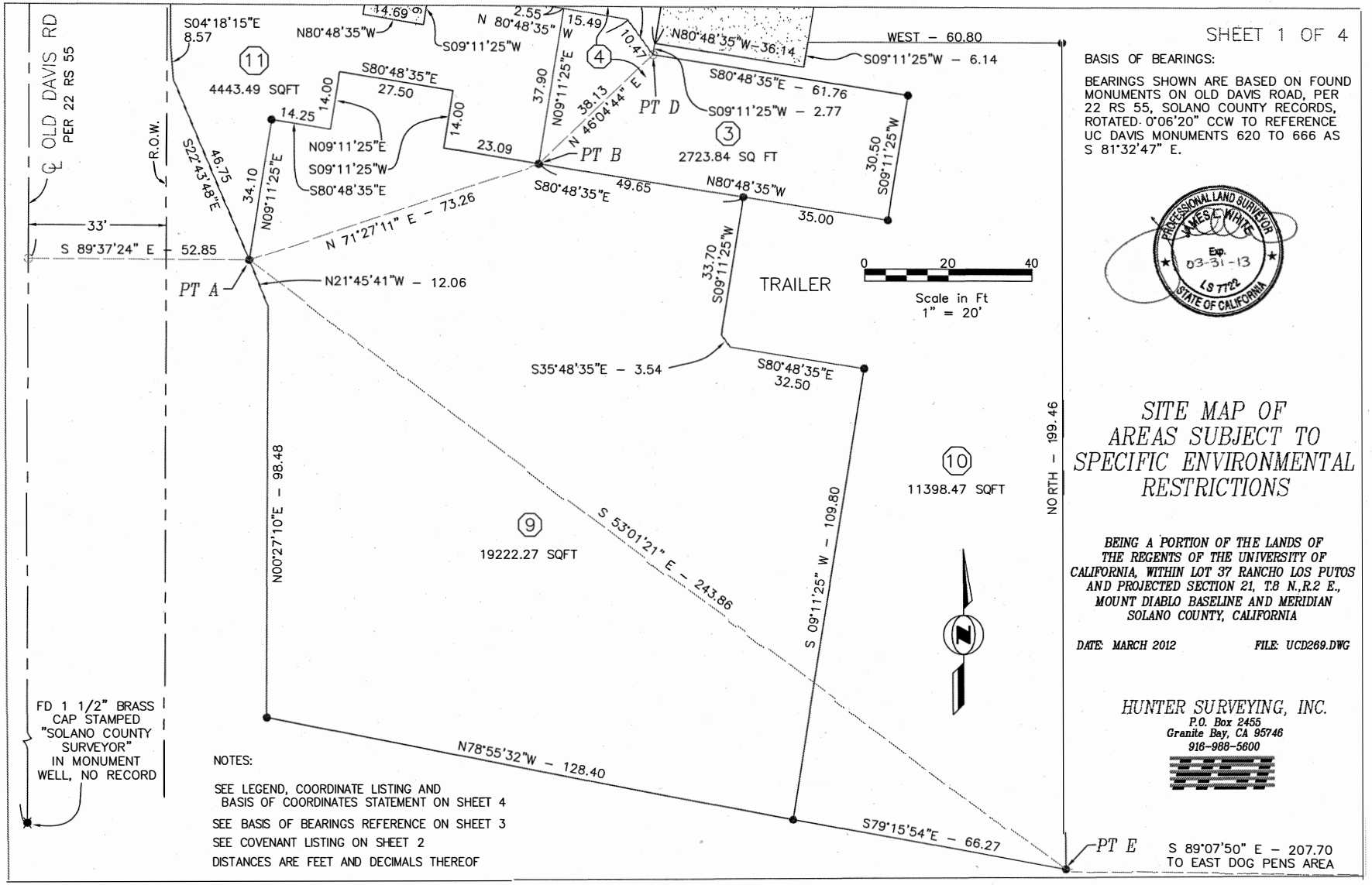
Survey Map Sheet 3 of 4

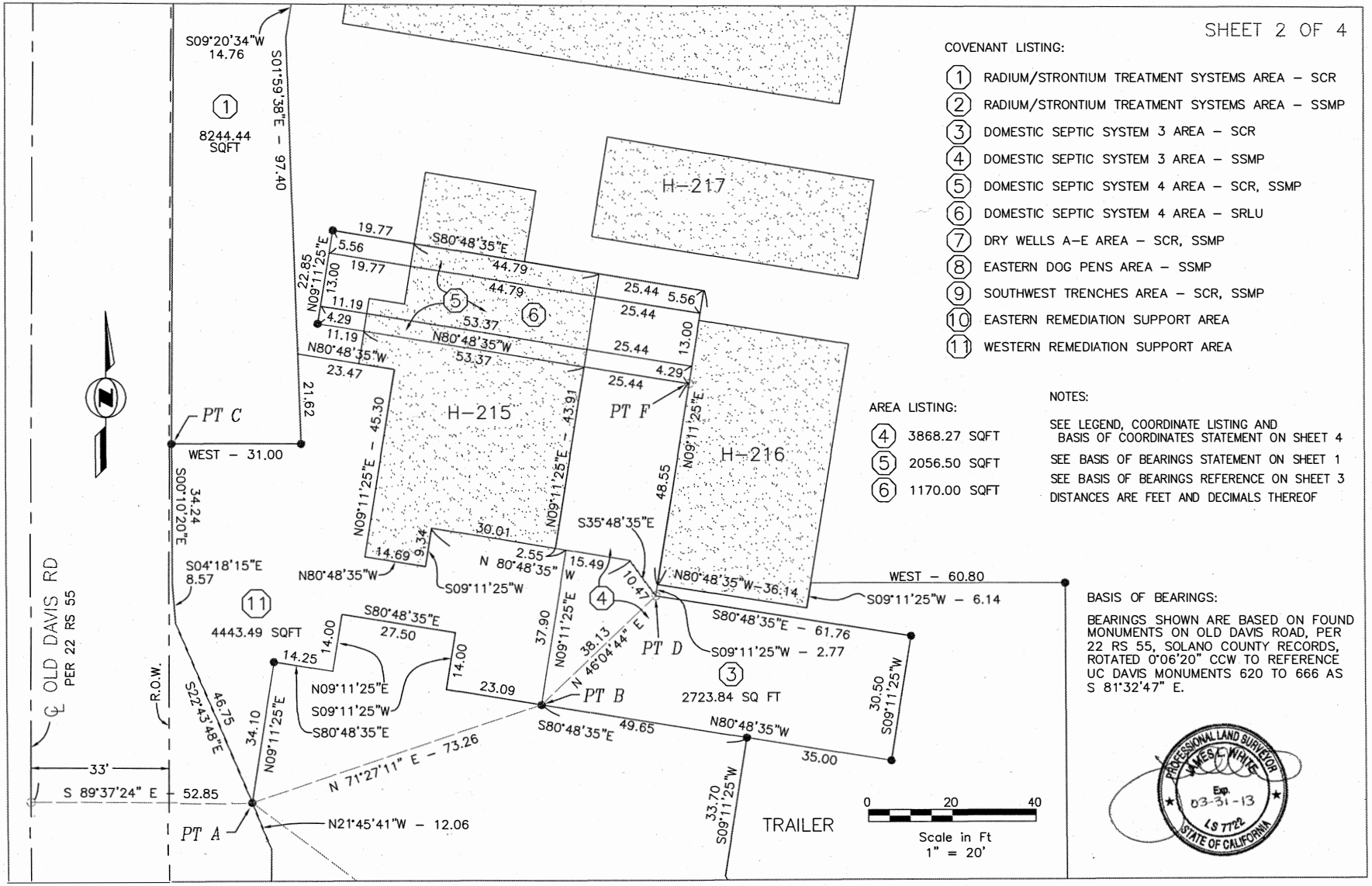
- Radium / Strontium Treatment Systems Area Subject to Contingent Remediation (Exhibit C-1)
- Radium / Strontium Treatment Systems Area Subject to Soil Management Plan (Exhibit C-2)
- Dry Wells A-E Area Subject to Contingent Remediation and Soil Management Plan (Exhibit C-7)

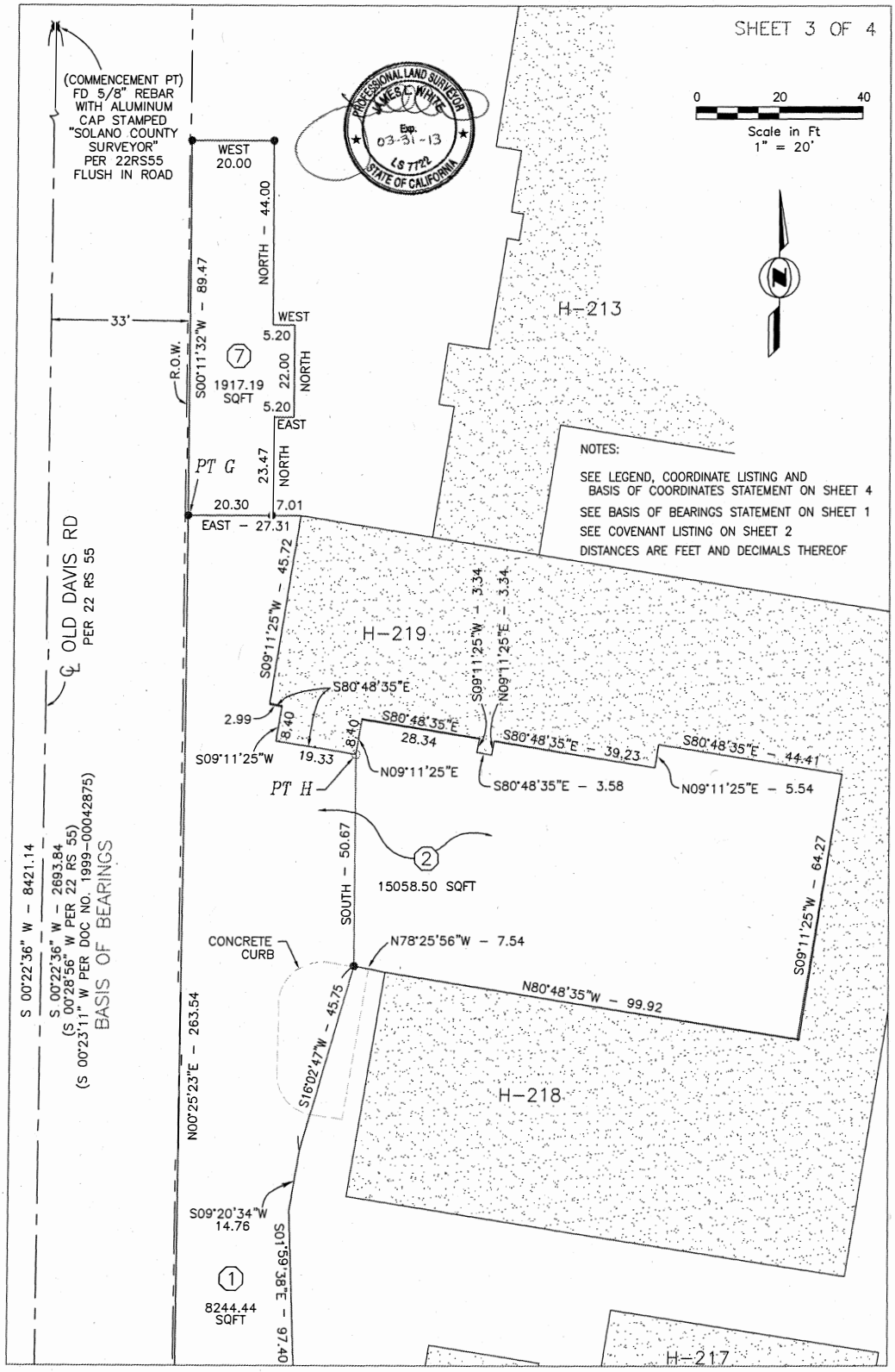
Survey Map Sheet 4 of 4

- Eastern Dog Pens Area Subject to Soil Management Plan (Exhibit C-8)

* Exhibit C-n corresponds to the legal descriptions.


SHEET 1 OF 4
BASIS OF BEARINGS:
BEARINGS SHOWN ARE BASED ON FOUND MONUMENTS ON OLD DAVIS ROAD, PER 22 RS 55, SOLANO COUNTY RECORDS, ROTATED 0°06'20" CCW TO REFERENCE UC DAVIS MONUMENTS 620 TO 666 AS S 81°32'47" E.
PROFESSIONAL LAND SURVEYOR JAMES C. WHITE Exp. 03-31-13 LS 7722 STATE OF CALIFORNIA
SITE MAP OF AREAS SUBJECT TO SPECIFIC ENVIRONMENTAL RESTRICTIONS
BEING A PORTION OF THE LANDS OF THE REGENTS OF THE UNIVERSITY OF CALIFORNIA, WITHIN LOT 37 RANCHO LOS PUTOS AND PROJECTED SECTION 21, T.8 N.,R.2 E., MOUNT DIABLO BASELINE AND MERIDIAN SOLANO COUNTY, CALIFORNIA
DATE: MARCH 2012
FILE: UCD269.DWG
HUNTER SURVEYING, INC.
P.O. Box 2455
Granite Bay, CA 95746
916-988-5600
℄ OLD DAVIS RD PER 22 RS 55
R.O.W.
33'
S 89°37'24" E – 52.85
PT A
S04°18'15"E 8.57
N80°48'35"W 14.69
S09°11'25"W
N 80°48'35" W 2.55
15.49
10.47
N80°48'35"W – 36.14
WEST – 60.80
S09°11'25"W – 6.14
S80°48'35"E – 61.76
S09°11'25"W – 2.77
PT D
PT B
PT E
11
4
3
4443.49 SQFT
S80°48'35"E 27.50
14.00
14.25
N09°11'25"E
S09°11'25"W
S80°48'35"E
14.00
23.09
37.90
N09°11'25"E
38.13
N 46°04'44" E
2723.84 SQ FT
30.50
S09°11'25"W
S80°48'35"E 49.65
N80°48'35"W 35.00
46.75
S52°43'48"E
34.10
N09°11'25"E
N 71°27'11" E – 73.26
33.70
S09°11'25"W
TRAILER
0 20 40
Scale in Ft
1" = 20'
N21°45'41"W – 12.06
S35°48'35"E – 3.54
S80°48'35"E 32.50
10
11398.47 SQFT
9
19222.27 SQFT
N00°27'10"E – 98.48
S 53°01'21" E – 243.86
S 09°11'25" W – 109.80
NORTH – 199.46
N78°55'32"W – 128.40
S79°15'54"E – 66.27
S 89°07'50" E – 207.70
TO EAST DOG PENS AREA
FD 1 1/2" BRASS CAP STAMPED "SOLANO COUNTY SURVEYOR" IN MONUMENT WELL, NO RECORD
NOTES:
SEE LEGEND, COORDINATE LISTING AND BASIS OF COORDINATES STATEMENT ON SHEET 4
SEE BASIS OF BEARINGS REFERENCE ON SHEET 3
SEE COVENANT LISTING ON SHEET 2
DISTANCES ARE FEET AND DECIMALS THEREOF


SHEET 2 OF 4
COVENANT LISTING:
1 RADIUM/STRONTIUM TREATMENT SYSTEMS AREA – SCR
2 RADIUM/STRONTIUM TREATMENT SYSTEMS AREA – SSMP
3 DOMESTIC SEPTIC SYSTEM 3 AREA – SCR
4 DOMESTIC SEPTIC SYSTEM 3 AREA – SSMP
5 DOMESTIC SEPTIC SYSTEM 4 AREA – SCR, SSMP
6 DOMESTIC SEPTIC SYSTEM 4 AREA – SRLU
7 DRY WELLS A–E AREA – SCR, SSMP
8 EASTERN DOG PENS AREA – SSMP
9 SOUTHWEST TRENCHES AREA – SCR, SSMP
10 EASTERN REMEDIATION SUPPORT AREA
11 WESTERN REMEDIATION SUPPORT AREA
AREA LISTING:
4 3868.27 SQFT
5 2056.50 SQFT
6 1170.00 SQFT
NOTES:
SEE LEGEND, COORDINATE LISTING AND BASIS OF COORDINATES STATEMENT ON SHEET 4
SEE BASIS OF BEARINGS STATEMENT ON SHEET 1
SEE BASIS OF BEARINGS REFERENCE ON SHEET 3
DISTANCES ARE FEET AND DECIMALS THEREOF
BASIS OF BEARINGS:
BEARINGS SHOWN ARE BASED ON FOUND MONUMENTS ON OLD DAVIS ROAD, PER 22 RS 55, SOLANO COUNTY RECORDS, ROTATED 0°06'20" CCW TO REFERENCE UC DAVIS MONUMENTS 620 TO 666 AS S 81°32'47" E.
PROFESSIONAL LAND SURVEYOR JAMES L. WHITE Exp. 03-31-13 LS 7722 STATE OF CALIFORNIA
℄ OLD DAVIS RD
PER 22 RS 55
R.O.W.
H–217
H–215
H–216
TRAILER
PT A
PT B
PT C
PT D
PT F
S09°20'34"W 14.76
S01°59'38"E – 97.40
8244.44 SQFT
WEST – 31.00
S00°10'20"E 34.24
S04°18'15"E 8.57
4443.49 SQFT
S22°43'48"E 46.75
N09°11'25"E 34.10
33'
S 89°37'24" E – 52.85
N21°45'41"W – 12.06
N 71°27'11" E – 73.26
N09°11'25"E 22.85
S80°48'35"E 19.77
5.56
19.77
44.79
44.79
13.00
11.19
4.29
53.37
N80°48'35"W 53.37
11.19
N80°48'35"W 23.47
21.62
N09°11'25"E – 45.30
N09°11'25"E – 43.91
25.44 5.56
25.44
25.44
13.00
4.29
25.44
48.55
N09°11'25"E
N80°48'35"W – 36.14
WEST – 60.80
S09°11'25"W – 6.14
S80°48'35"E – 61.76
S09°11'25"W – 2.77
2723.84 SQ FT
30.50 S09°11'25"W
N80°48'35"W 35.00
33.70 S09°11'25"W
S80°48'35"E 49.65
23.09
14.00
S80°48'35"E 27.50
14.00
14.25
N09°11'25"E
S09°11'25"W
S80°48'35"E
37.90 N09°11'25"E
38.13 N 46°04'44" E
S35°48'35"E
15.49
10.47
N 80°48'35" W
2.55
30.01
9.34
14.69
N80°48'35"W
S09°11'25"W
S09°11'25"W
0 20 40
Scale in Ft
1" = 20'


SHEET 3 OF 4
0 20 40
Scale in Ft
1" = 20'
PROFESSIONAL LAND SURVEYOR
JAMES C. WHITE
Exp. 03-31-13
LS 7722
STATE OF CALIFORNIA
(COMMENCEMENT PT)
FD 5/8" REBAR
WITH ALUMINUM
CAP STAMPED
"SOLANO COUNTY
SURVEYOR"
PER 22RS55
FLUSH IN ROAD
WEST
20.00
NORTH - 44.00
WEST
5.20
NORTH
22.00
5.20
EAST
NORTH
23.47
PT G
20.30
7.01
EAST - 27.31
S00°11'32"W - 89.47
33'
R.O.W.
7
1917.19
SQFT
H-213
NOTES:
SEE LEGEND, COORDINATE LISTING AND
BASIS OF COORDINATES STATEMENT ON SHEET 4
SEE BASIS OF BEARINGS STATEMENT ON SHEET 1
SEE COVENANT LISTING ON SHEET 2
DISTANCES ARE FEET AND DECIMALS THEREOF
℄ OLD DAVIS RD
PER 22 RS 55
S 00°22'36" W - 8421.14
S 00°22'36" W - 2693.84
(S 00°28'56" W PER 22 RS 55)
(S 00°23'11" W PER DOC NO. 1999-00042875)
BASIS OF BEARINGS
H-219
S09°11'25"W - 45.72
S09°11'25"W - 3.34
N09°11'25"E - 3.34
S80°48'35"E
2.99
8.40
S80°48'35"E
28.34
8.40
S09°11'25"W
19.33
N09°11'25"E
PT H
S80°48'35"E - 39.23
S80°48'35"E - 44.41
S80°48'35"E - 3.58
N09°11'25"E - 5.54
2
15058.50 SQFT
SOUTH - 50.67
CONCRETE
CURB
N78°25'56"W - 7.54
S09°11'25"W - 64.27
N80°48'35"W - 99.92
S16°02'47"W - 45.75
N00°25'23"E - 263.54
H-218
S09°20'34"W
14.76
S01°59'38"E - 97.40
1
8244.44
SQFT
H-217

SHEET 4 OF 4

LEGEND:

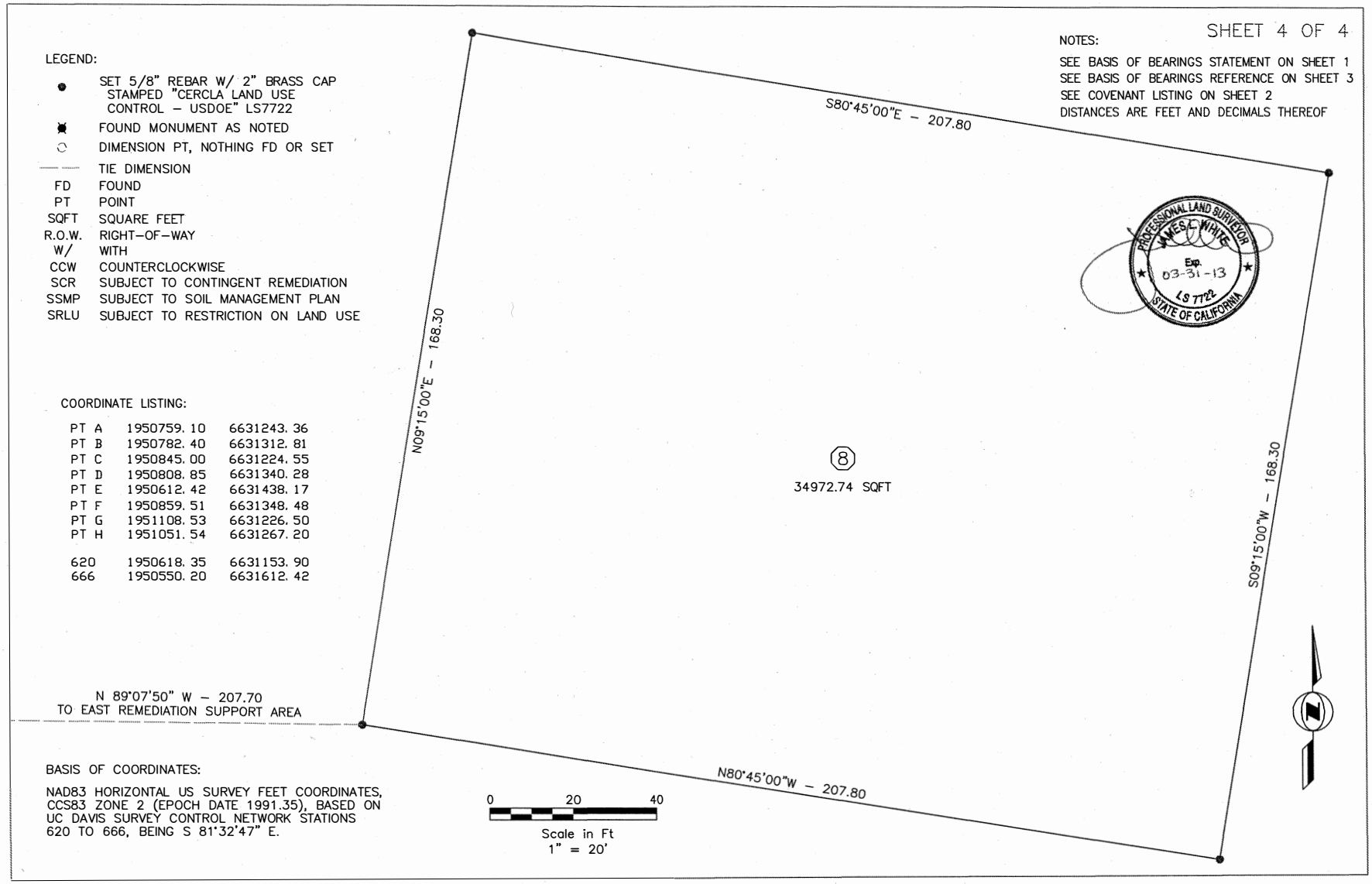
●	SET 5/8" REBAR W/ 2" BRASS CAP STAMPED "CERCLA LAND USE CONTROL – USDOE" LS7722
✱	FOUND MONUMENT AS NOTED
○	DIMENSION PT, NOTHING FD OR SET
	TIE DIMENSION
FD	FOUND
PT	POINT
SQFT	SQUARE FEET
R.O.W.	RIGHT–OF–WAY
W/	WITH
CCW	COUNTERCLOCKWISE
SCR	SUBJECT TO CONTINGENT REMEDIATION
SSMP	SUBJECT TO SOIL MANAGEMENT PLAN
SRLU	SUBJECT TO RESTRICTION ON LAND USE

NOTES:

SEE BASIS OF BEARINGS STATEMENT ON SHEET 1
SEE BASIS OF BEARINGS REFERENCE ON SHEET 3
SEE COVENANT LISTING ON SHEET 2
DISTANCES ARE FEET AND DECIMALS THEREOF

COORDINATE LISTING:

PT A	1950759.10	6631243.36
PT B	1950782.40	6631312.81
PT C	1950845.00	6631224.55
PT D	1950808.85	6631340.28
PT E	1950612.42	6631438.17
PT F	1950859.51	6631348.48
PT G	1951108.53	6631226.50
PT H	1951051.54	6631267.20
620	1950618.35	6631153.90
666	1950550.20	6631612.42



BASIS OF COORDINATES:

NAD83 HORIZONTAL US SURVEY FEET COORDINATES, CCS83 ZONE 2 (EPOCH DATE 1991.35), BASED ON UC DAVIS SURVEY CONTROL NETWORK STATIONS 620 TO 666, BEING S 81°32'47" E.

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Appendix B

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

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Table B-1. Contaminants Detected at Concentrations Above Background in the Radium/Strontium Treatment Systems Area, 0–10 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	16,500–45,400	0.47–22.3	44,000	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

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

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% or more in soil from 0 to 10 feet below ground surface (SWRA Table 2 [UC Davis 2004]).
Copy of soil data provided in Appendix D.
[a] Background values for surface soil (0–4 feet below ground surface) and subsurface soil (greater than 4 feet below ground surface) provided for constituents with statistically significant vertical stratification (DOE 2000a; DOE 2000b). Single background value provided for nonstratified constituents.

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

Table B-2. Contaminants Detected at Concentrations Above Background in the Domestic Septic System 3, 0–10 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

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

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% or more in soil from 0 to 10 feet below ground surface (SWRA Table 2 [UC Davis 2004]).
Copy of soil data provided in Appendix D.
[a] Background values for surface soil (0–4 feet below ground surface) and subsurface soil (greater than 4 feet below ground surface) provided for constituents with statistically significant vertical stratification (DOE 2000a; DOE 2000b). Single background value provided for nonstratified constituents.

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

Table B-3. Contaminants Detected at Concentrations Above Background in the Domestic Septic System 4, 0–10 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(*g,h,i*)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

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

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% or more in soil from 0 to 10 feet below ground surface. SWRA Table 2 (UC Davis 2004).
Copy of soil data provided in Appendix D.
[a] Background values for surface soil (0–4 feet below ground surface) and subsurface soil (greater than 4 feet below ground surface) provided for constituents with statistically significant vertical stratification (DOE 2000a; DOE 2000b). Single background value provided for nonstratified constituents.

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

Table B-4. Contaminants Detected at Concentrations Above Background in the Dry Wells A–E Area, 0–10 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	30,200–40,300	0.48–24.6	44,000	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

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

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% or more in soil from 0 to 10 feet below ground surface. SWRA Table 2 (UC Davis 2004).
Copy of soil data provided in Appendix D.
[a] Background values for surface soil (0–4 feet below ground surface) and subsurface soil (greater than 4 feet below ground surface) provided for constituents with statistically significant vertical stratification (DOE 2000a; DOE 2000b). Single background value provided for nonstratified 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

Table B-5. Contaminants Detected at Concentrations Above Background in the Southwest Trenches Area, 0–10 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	21,000–44,200	19.5–220	44,000	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

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

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)
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

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% or more in soil from 0 to 10 feet below ground surface. SWRA Table 2 (UC Davis 2004).
Copy of soil data provided in Appendix D.
[a] Background values for surface soil (0–4 feet below ground surface) and subsurface soil (greater than 4 feet below ground surface) provided for constituents with statistically significant vertical stratification (DOE 2000a; DOE 2000b). Single background value provided for nonstratified constituents.

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

Table B-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 Appendix D.
[a] Background values for surface soil (0–4 feet below ground surface) and subsurface soil (greater than 4 feet below ground surface) provided for constituents with statistically significant vertical stratification (DOE 2000a; DOE 2000b). Single background value provided for nonstratified constituents.

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

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Appendix C

Soil Sample Location Figures

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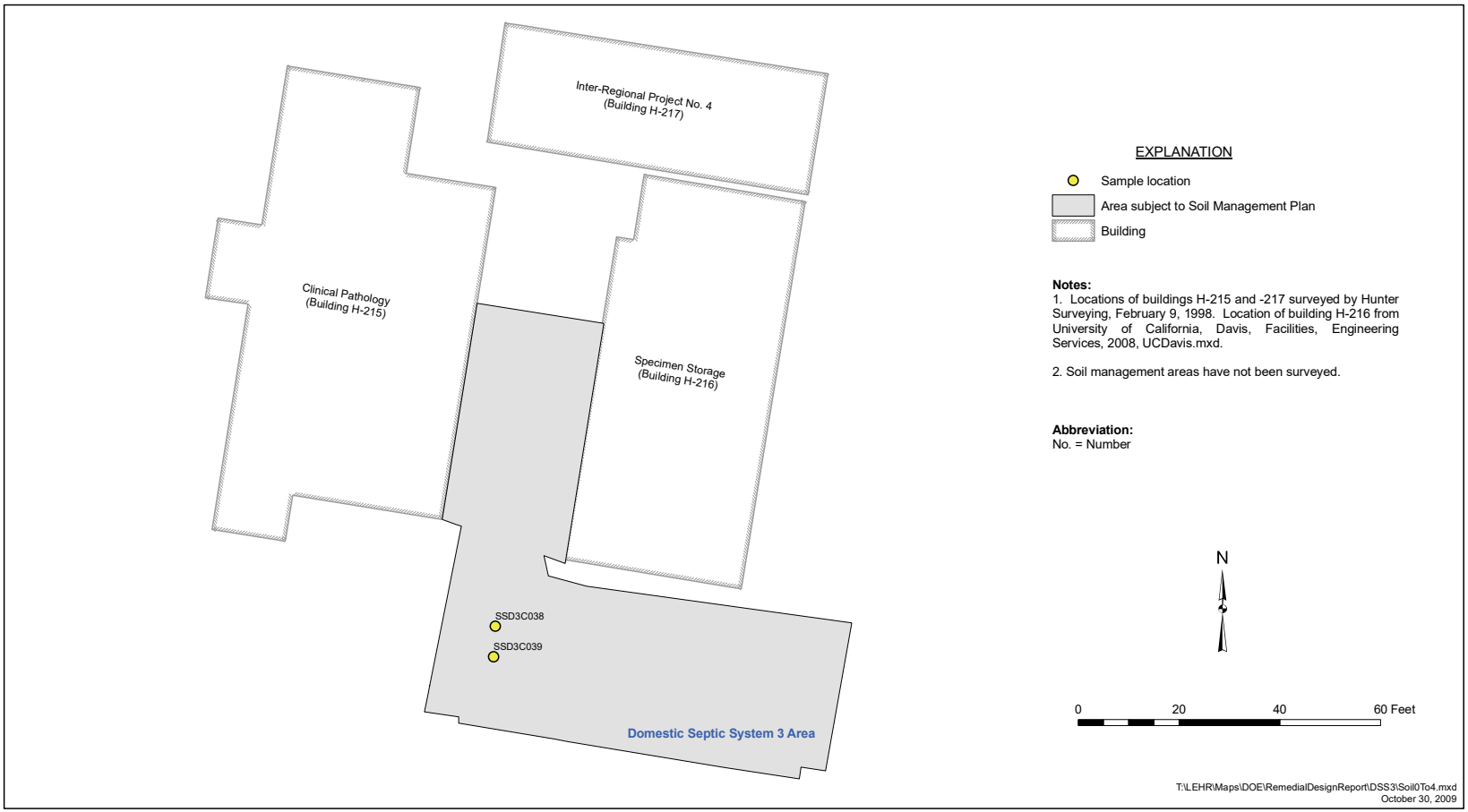


Figure C-1. Soil Sample Locations for the Domestic Septic System 3 Area (0–4 Feet Below Ground Surface)

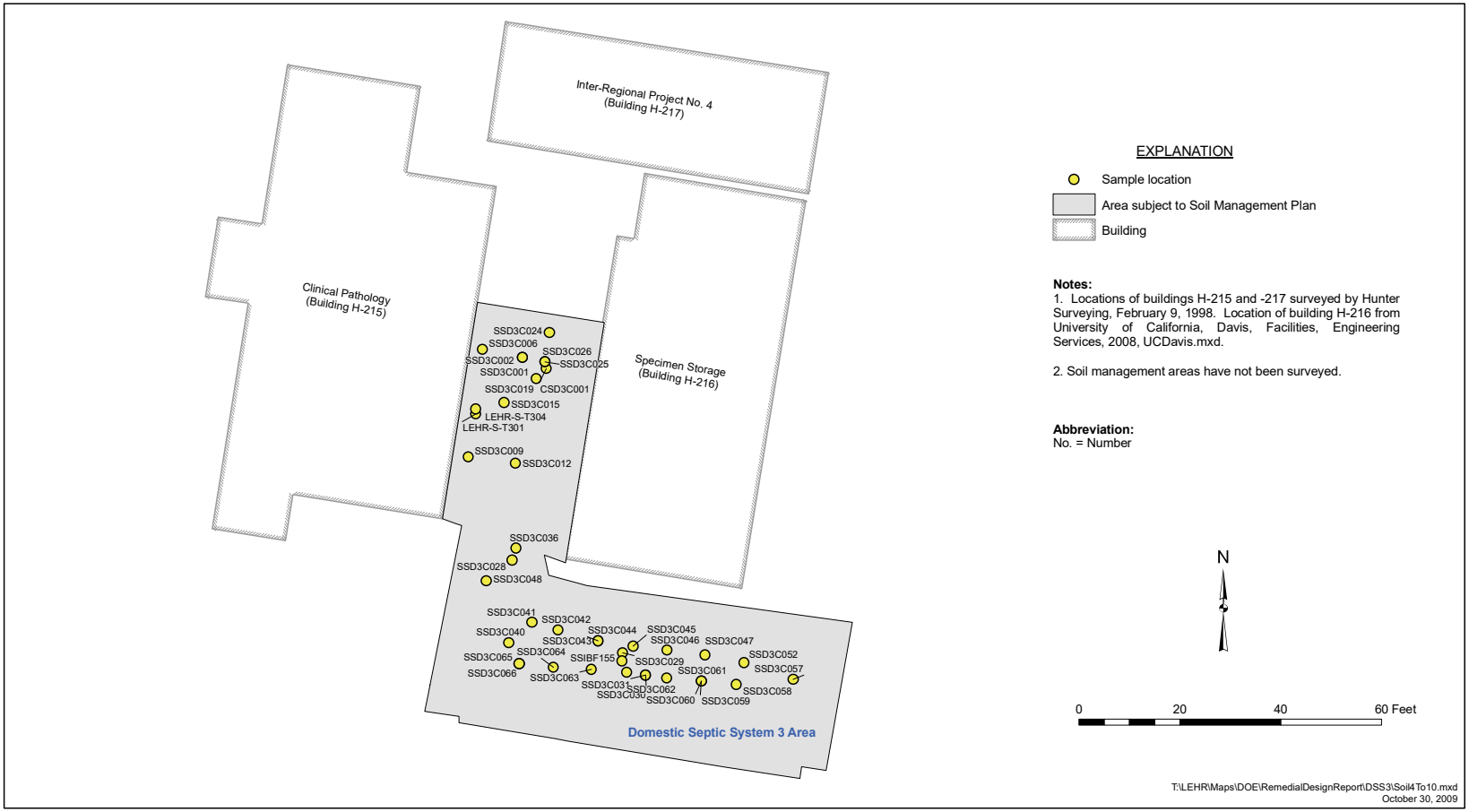


Figure C-2. Soil Sample Locations for the Domestic Septic System 3 Area (>4 to 10 Feet Below Ground Surface)

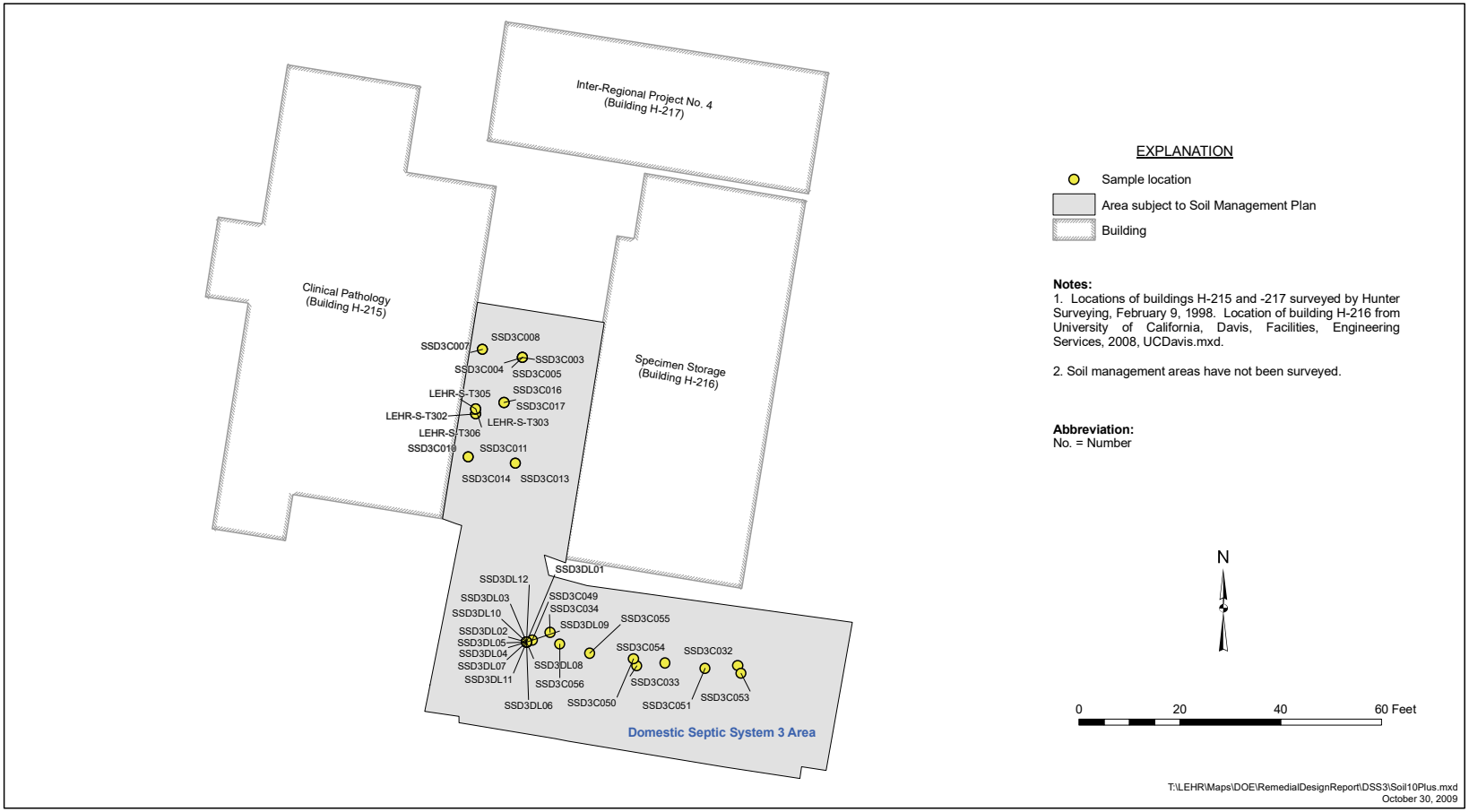
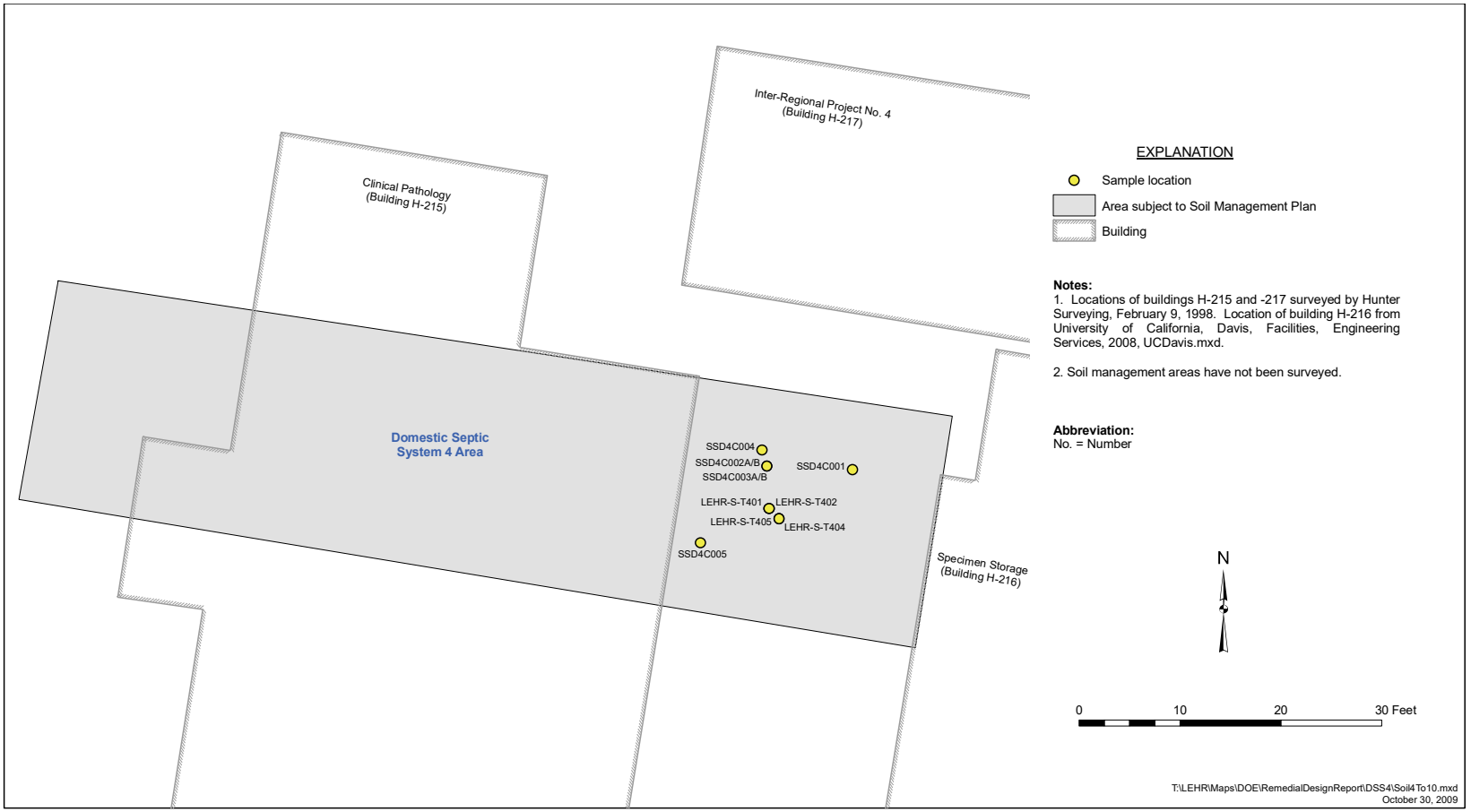


Figure C-3. Soil Sample Locations for the Domestic Septic System 3 Area (>10 to 40 Feet Below Ground Surface)



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.

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

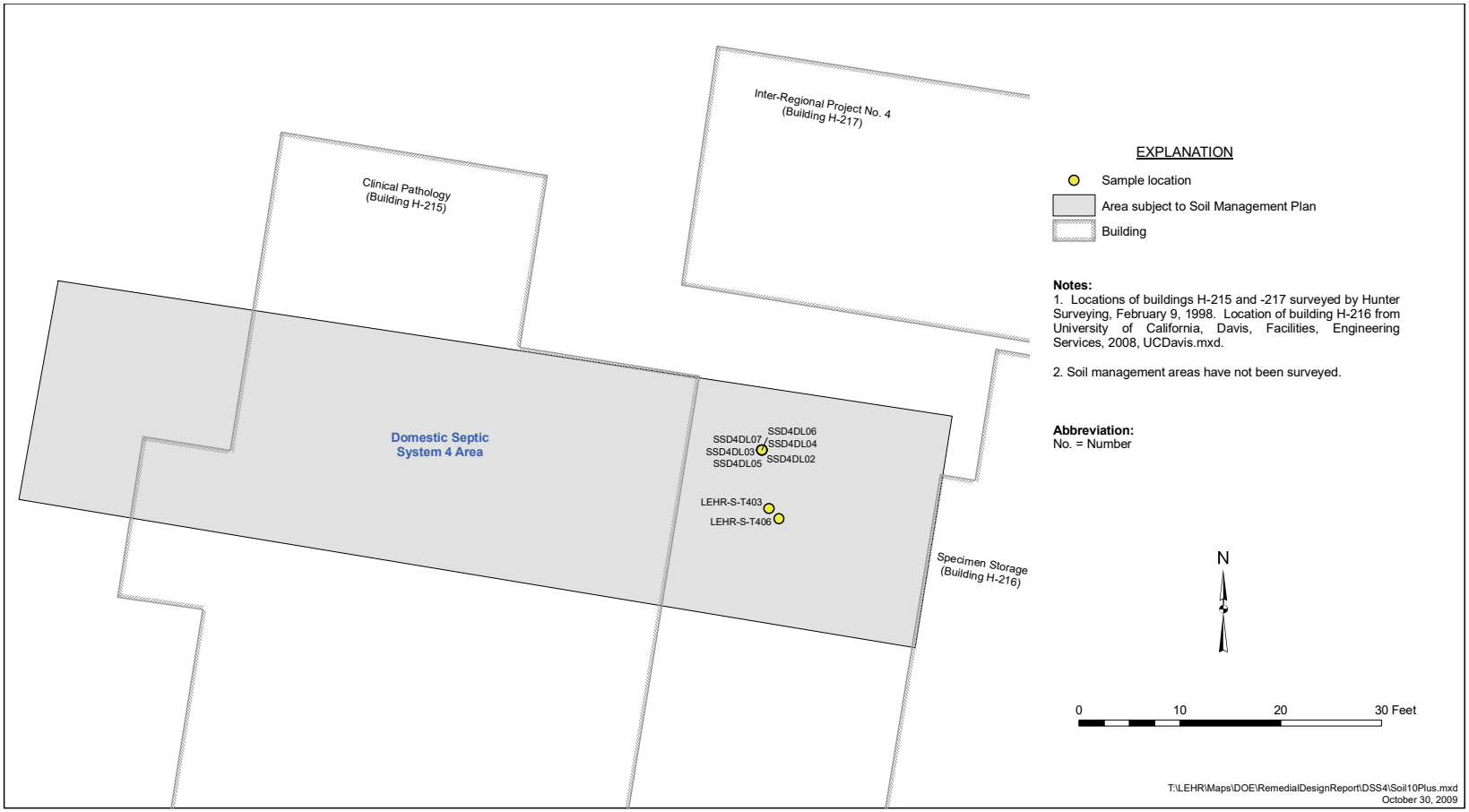


Figure C-5. Soil Sample Locations for the Domestic Septic System 4 Area (>10 to 37.8 Feet Below Ground Surface)

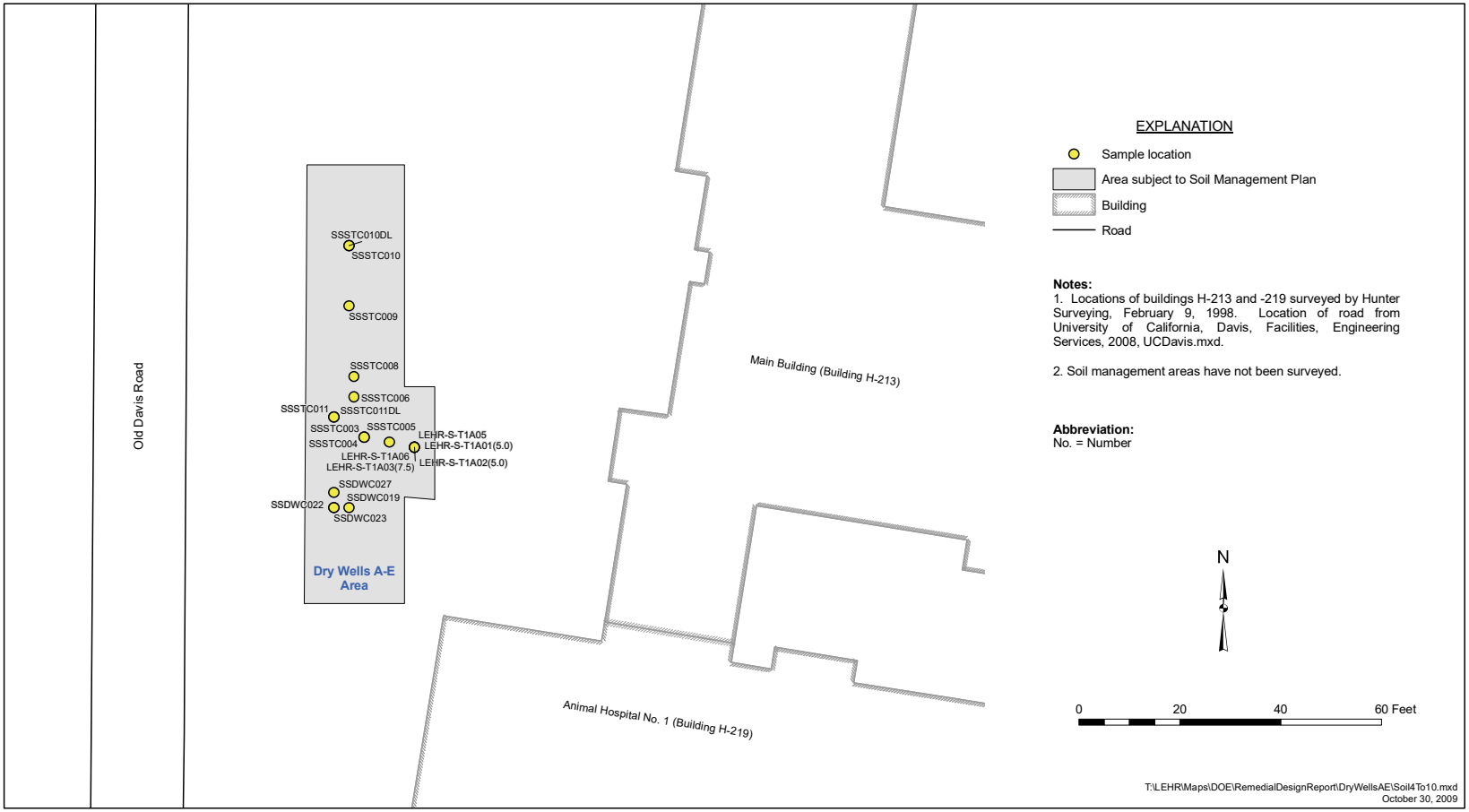


Figure C-6. Soil Sample Locations for the Dry Wells A–E Area (>4 to 10 Feet Below Ground Surface)

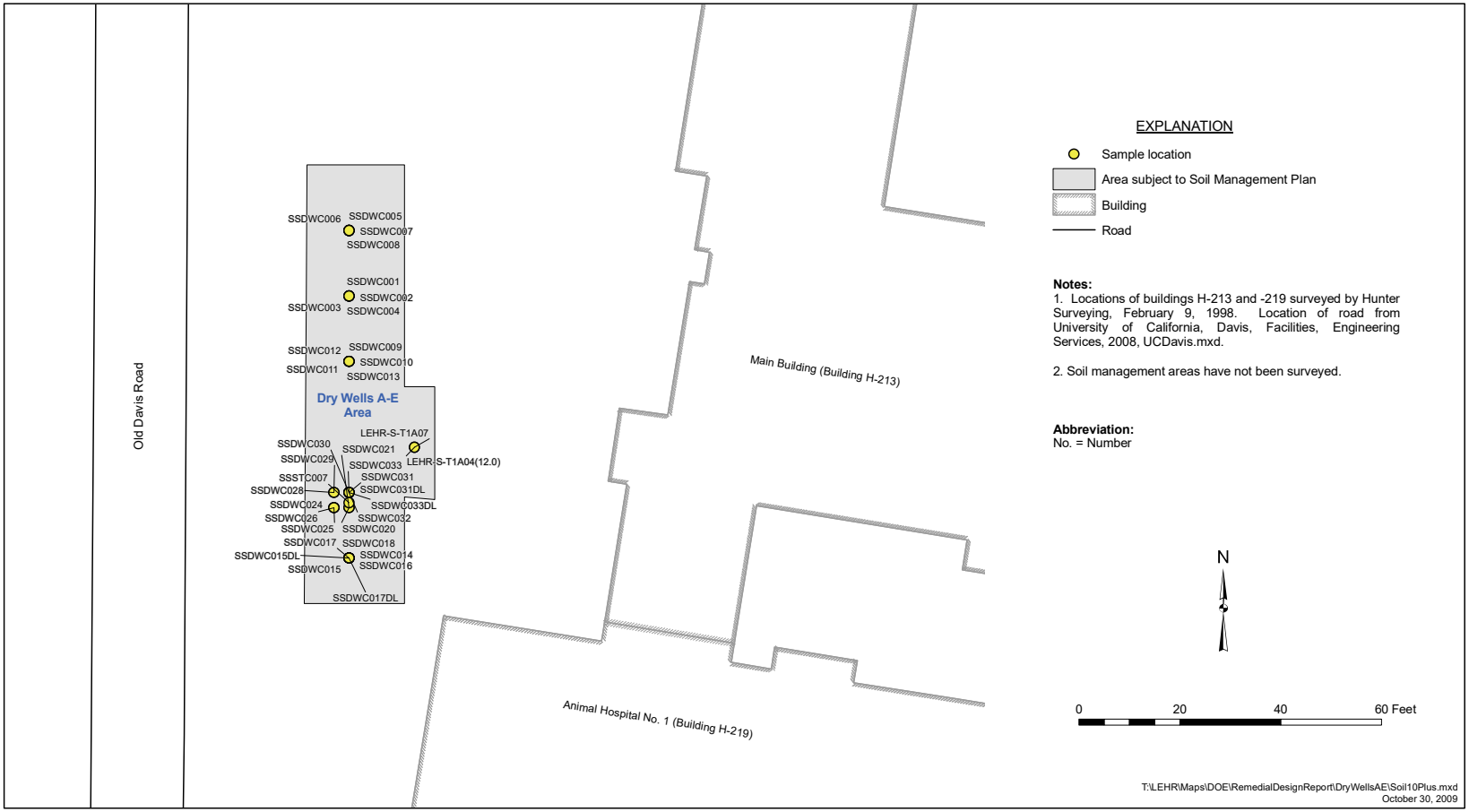


Figure C-7. Soil Sample Locations for the Dry Wells A–E Area (>10 to 40 Feet Below Ground Surface)

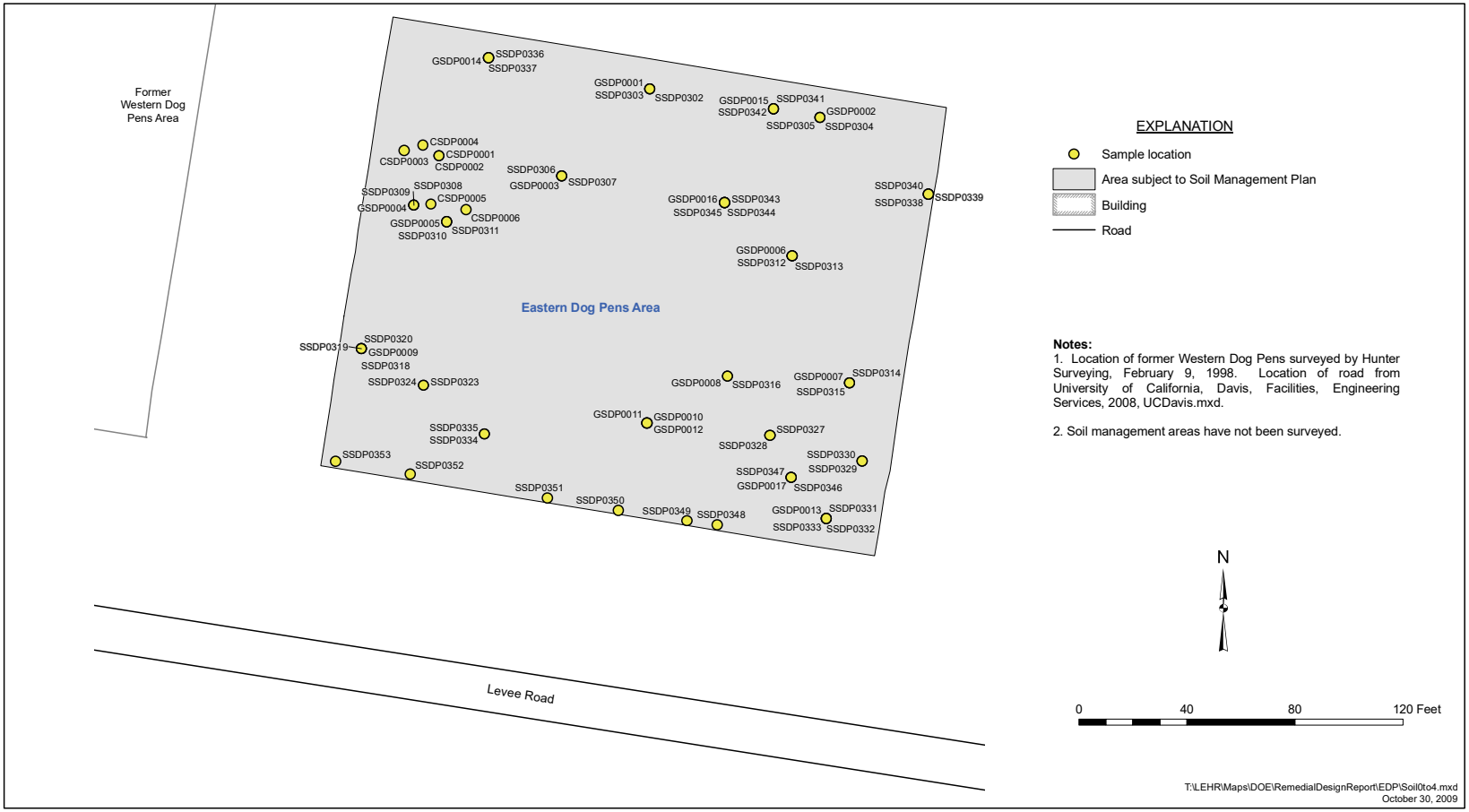


Figure C-8. Soil Sample Locations for the Eastern Dog Pens Area (0–4 Feet Below Ground Surface)

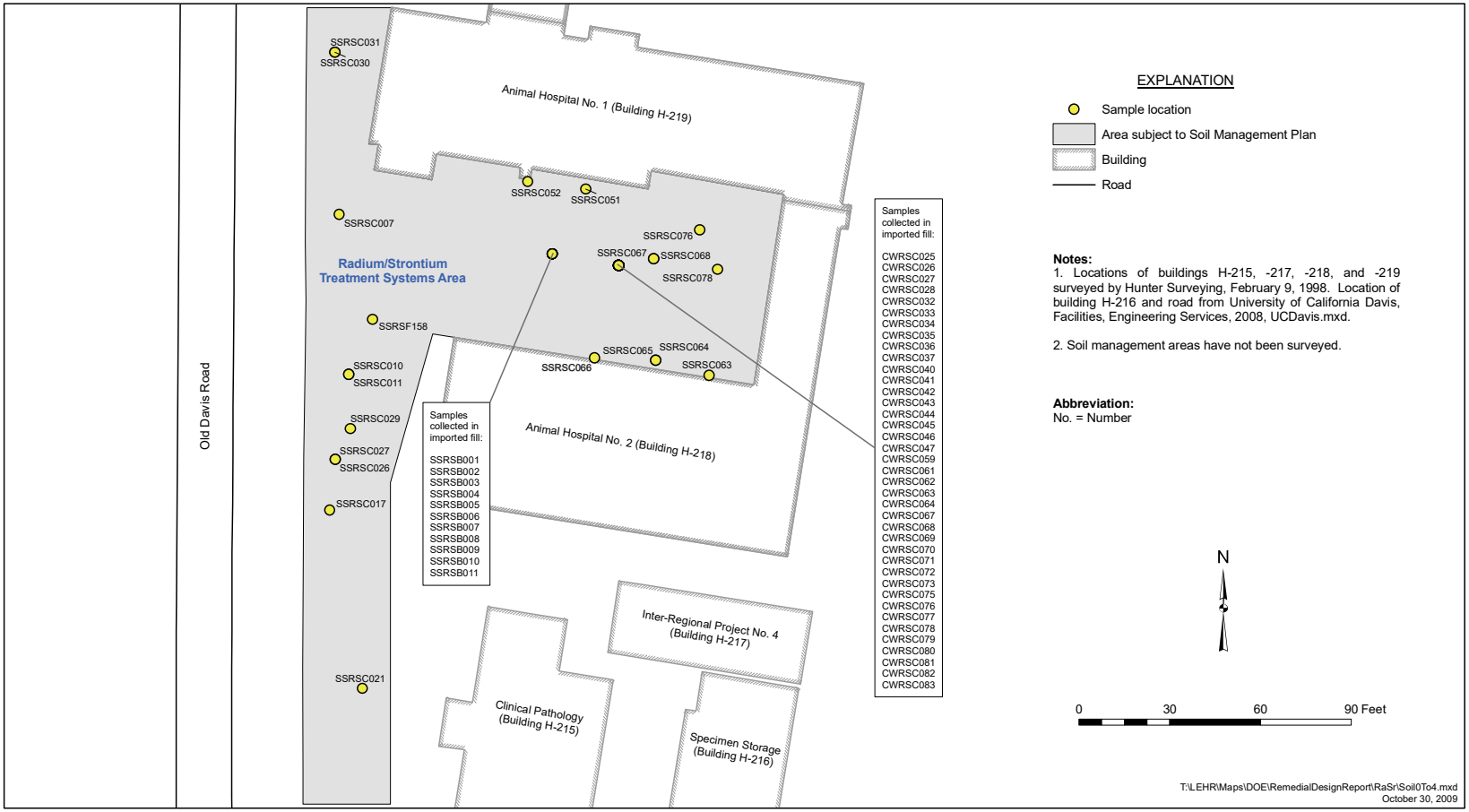


Figure C-9. Soil Sample Locations for the Radium/Strontium Treatment Systems Area (0–4 Feet Below Ground Surface)

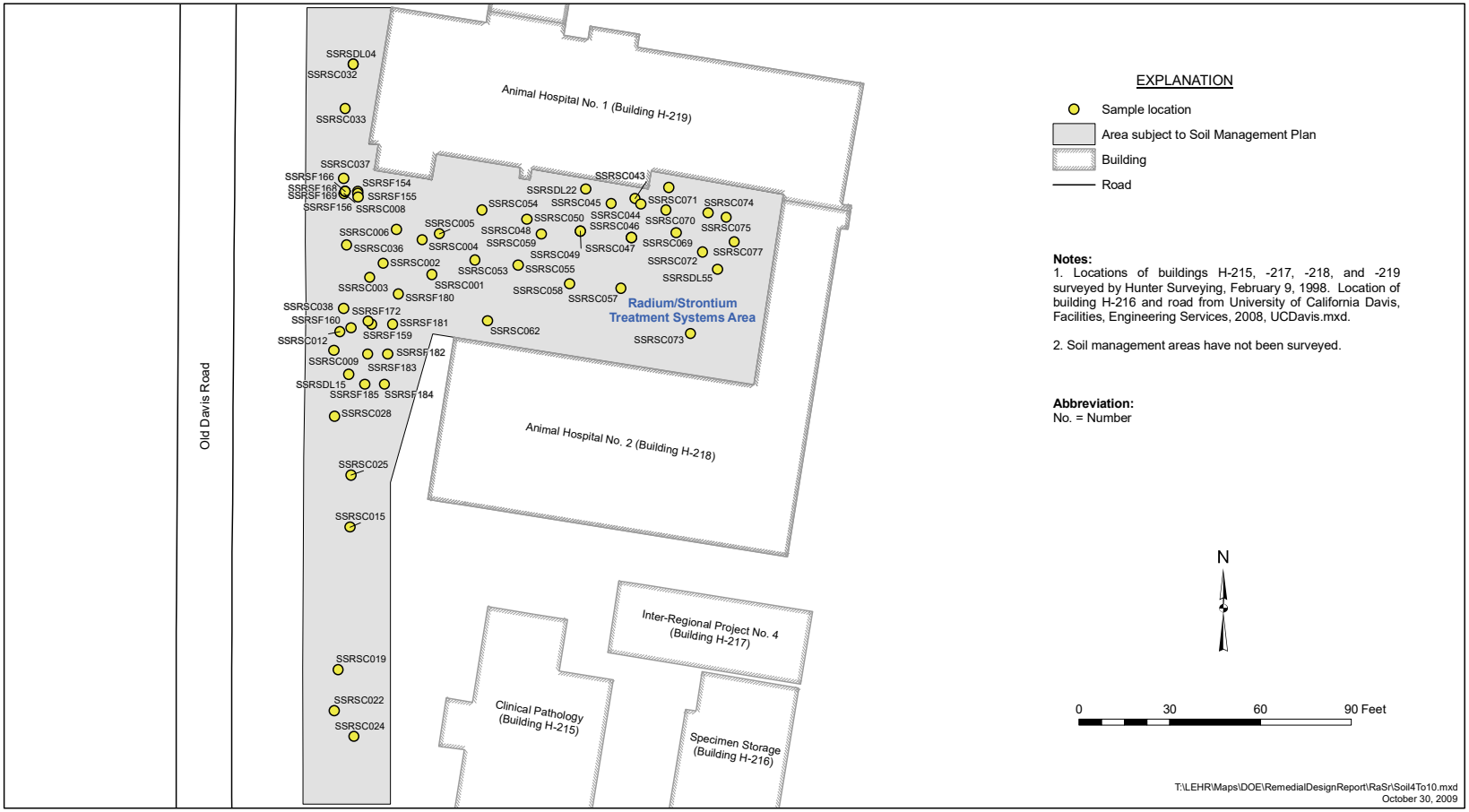


Figure C-10. Soil Sample Locations for the Radium/Strontium Treatment Systems Area (>4 to 10 Feet Below Ground Surface)

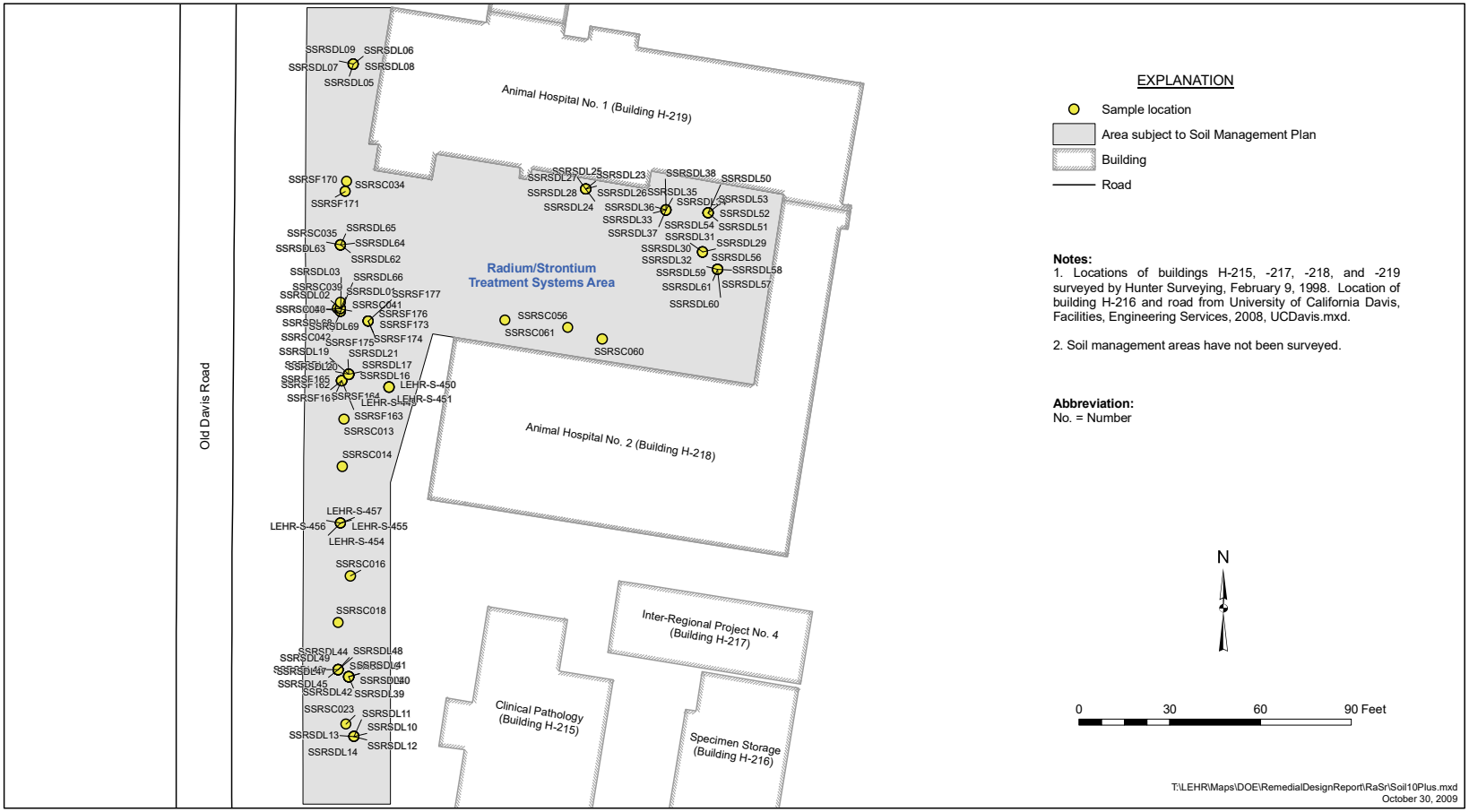


Figure C-11. Soil Sample Locations for the Radium/Strontium Treatment Systems Area (>10 to 47.5 Feet Below Ground Surface)

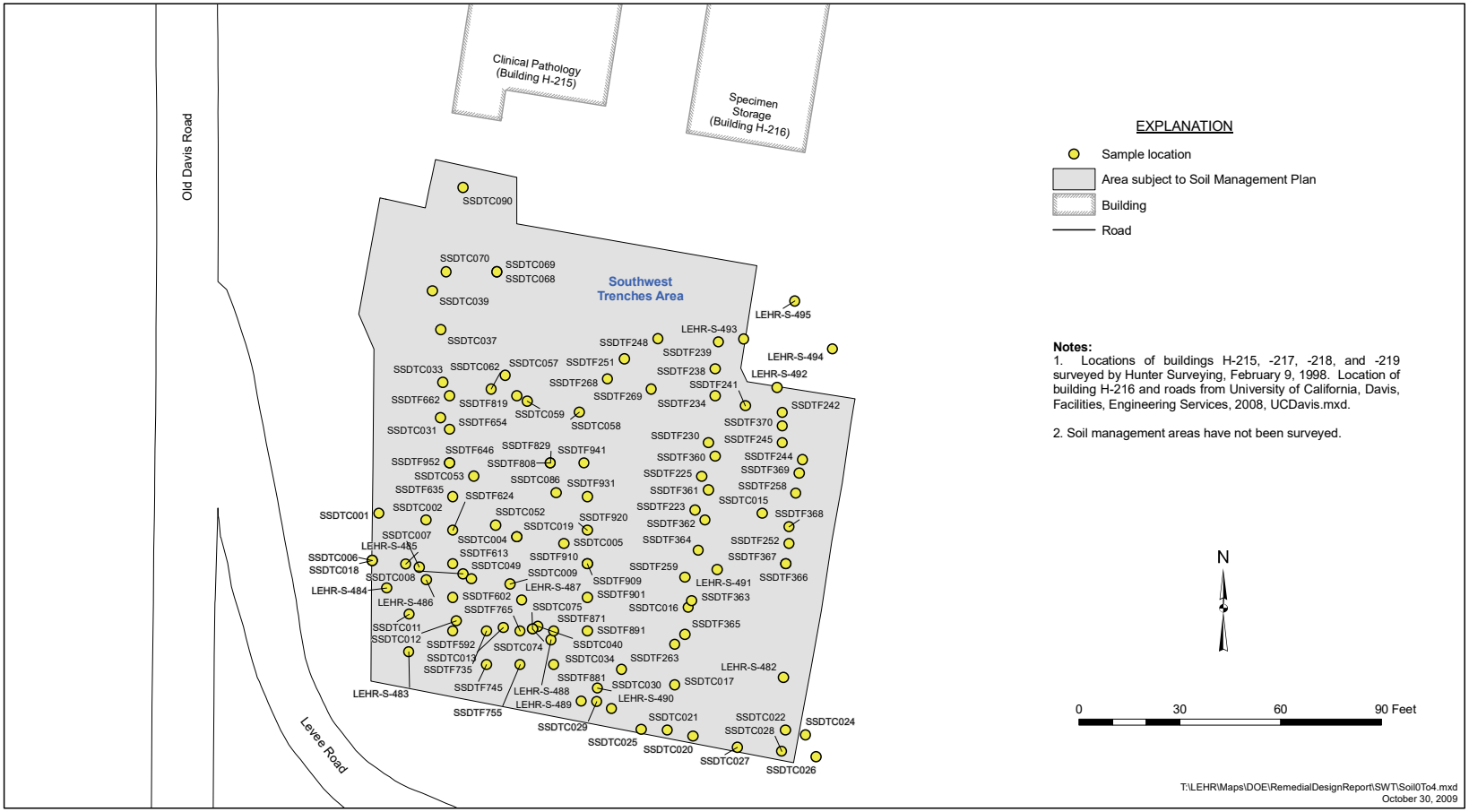


Figure C-12. Soil Sample Locations for the Southwest Trenches Area (0–4 Feet Below Ground Surface)

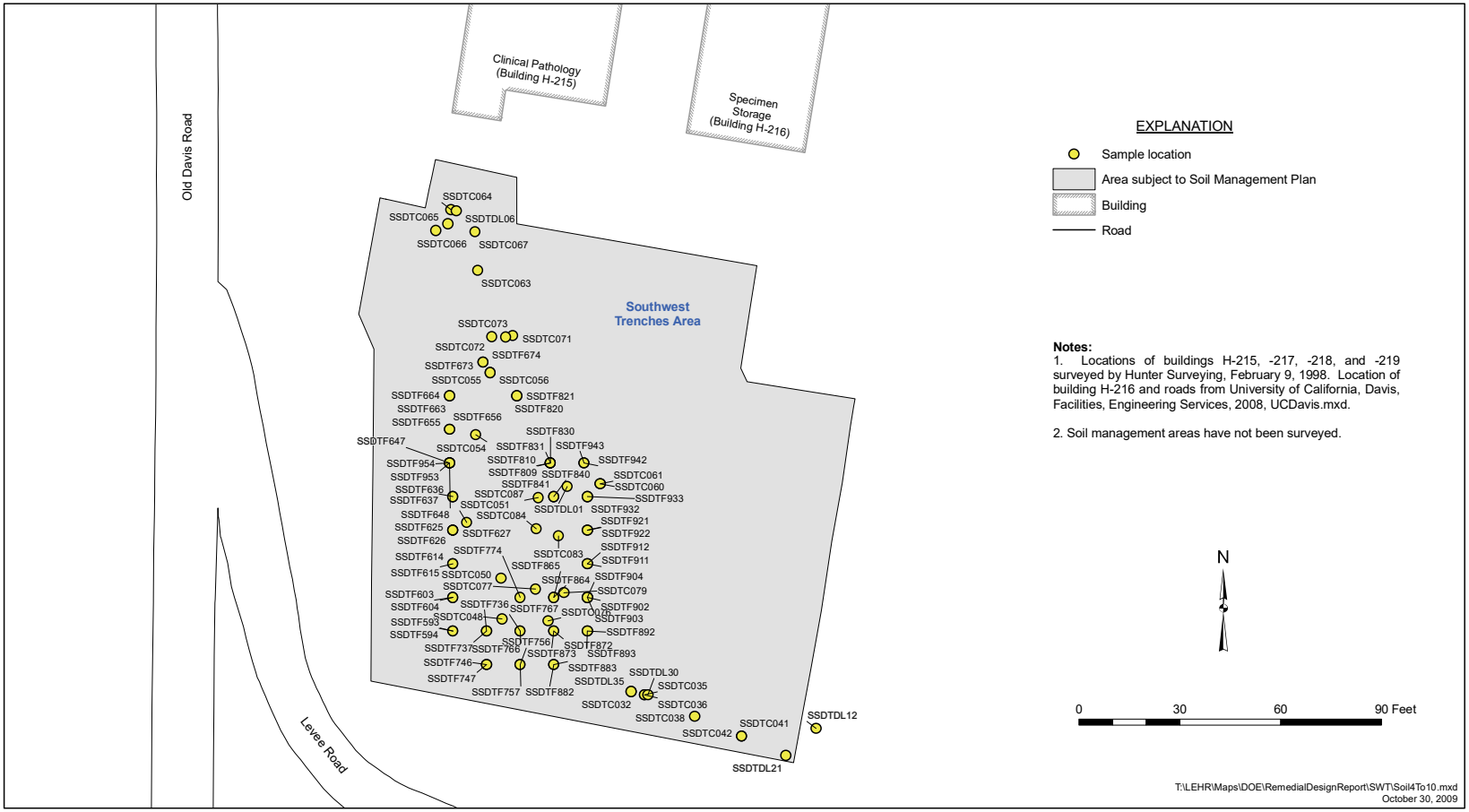


Figure C-13. Soil Sample Locations for the Southwest Trenches Area (>4 to 10 Feet Below Ground Surface)

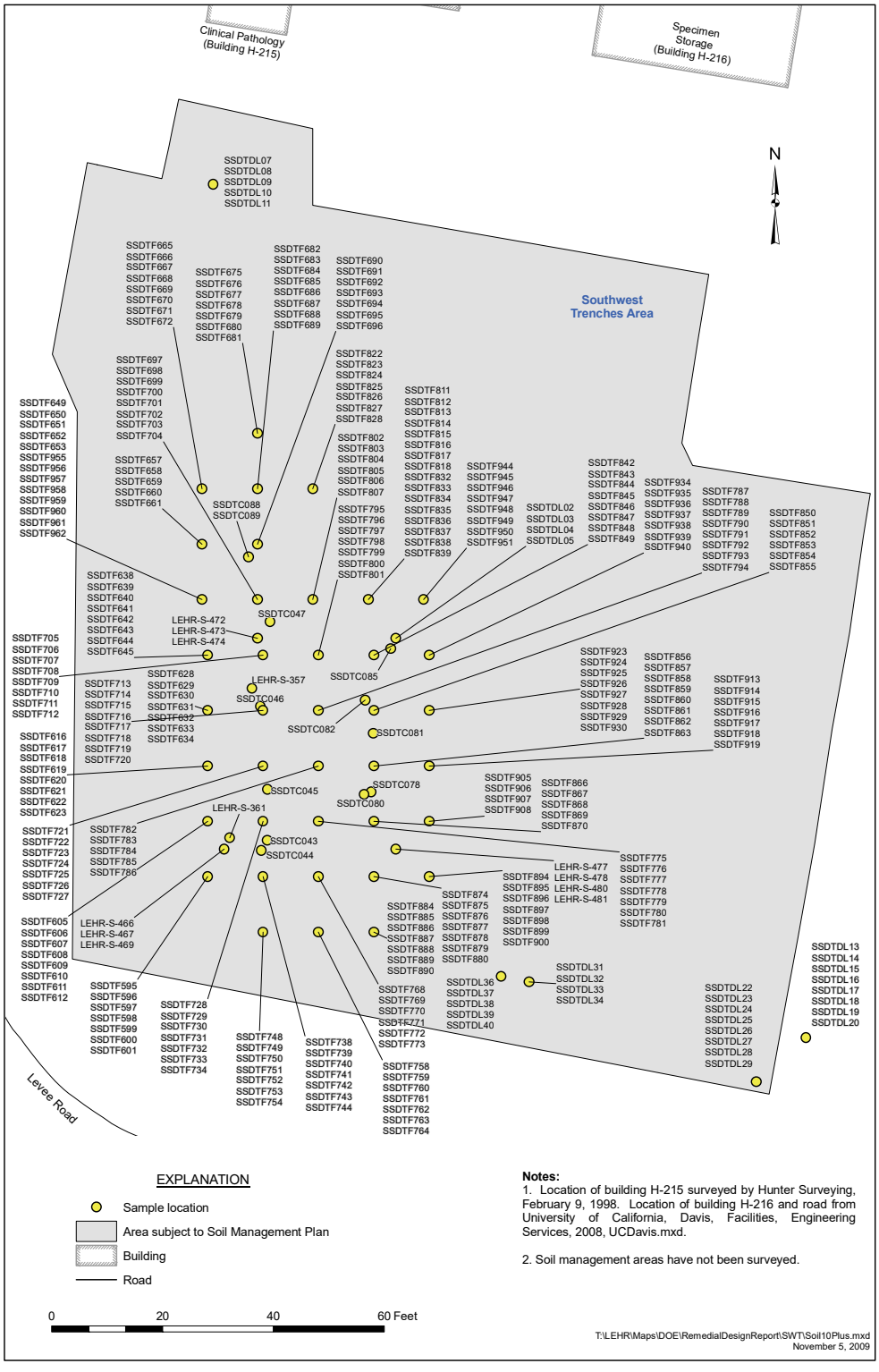


Figure C-14. Soil Sample Locations for the Southwest Trenches Area (>10 to 44 Feet Below Ground Surface)

Appendix D

Analytical Results and Soil Samples Collected in DOE Areas

(Data available for download at:
https://drive.google.com/open?id=14irQsqk0jWclJ5tYlZUJKp0GYguRafBv)

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Appendix E

Soil Disturbance and Tree/Shrub Removal Permit

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PERMIT APPLICATION FOR SOIL DISTURBANCE AND TREE/SHRUB REMOVAL 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, if any: _____

☐ Map indicating project location(s) and anticipated area(s) of soil disturbance, if any, 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 or trees/shrubs to be removed are 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 or remove trees/shrubs 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 or removed trees/shrubs will be sampled for constituents in attached table. (attach SMP Table 1 and indicate sections applicable to area being disturbed.)
- ☐ Soil disturbed at 0–10 feet below ground surface or removed trees/shrubs contaminated above site background may not be reused on site without a risk assessment approved by DTSC and EPA. Soil or trees/shrubs 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: Appendix D 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 or vegetation scan/sampling/characterization activities associated with this soil disturbance or tree/shrub removal will be submitted to the EH&S Unit.
- ☐ Provide map of tree/shrub removal or 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:

Appendix F

Tree and Shrub Survey and 2017 Walnut Tree Removal

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UCDAVIS
FACILITIES MANAGEMENT
Buildings & Grounds

November 7, 2016

In response to the request made by Viviana Acevedo-Bolton (Weiss Associates) for a plant survey at the LEHR site on the UC Davis Campus, I have enclosed a map and table with the location, size and general health of the trees and shrubs within the designated survey area (Figure 1).

Only vegetation taller than 6 feet was included in this survey. Grasses, shrubs, and saplings less than 6 feet tall were not included. 64 trees and shrubs were located within the boundaries of the requested survey.

The size of vegetation was measured in two ways: diameter of the trunk at breast height (DBH), and overall height (in 5-meter increments). All measurements are in metric units.

A general health rating of Good/Fair/Poor was given to each tree and shrub, which corresponds to the following:

- Good: the plant is thriving, but may have minor defects that are correctable with mild pruning.
- Fair: the plant is thriving, but has major structural or health defects that are correctable with severe pruning.
- Poor: the majority of the plant's branches are dead, or it has major defects that are not correctable.

Of the 64 trees and shrubs surveyed, 33 were found to be in "Good" condition, 24 "Fair", and 7 "Poor".

Please let me know if I can provide any further assistance.

Sincerely,

Melanie Gentles
UC Davis Campus Arborist
mhgentles@ucdavis.edu
(530) 574-9584

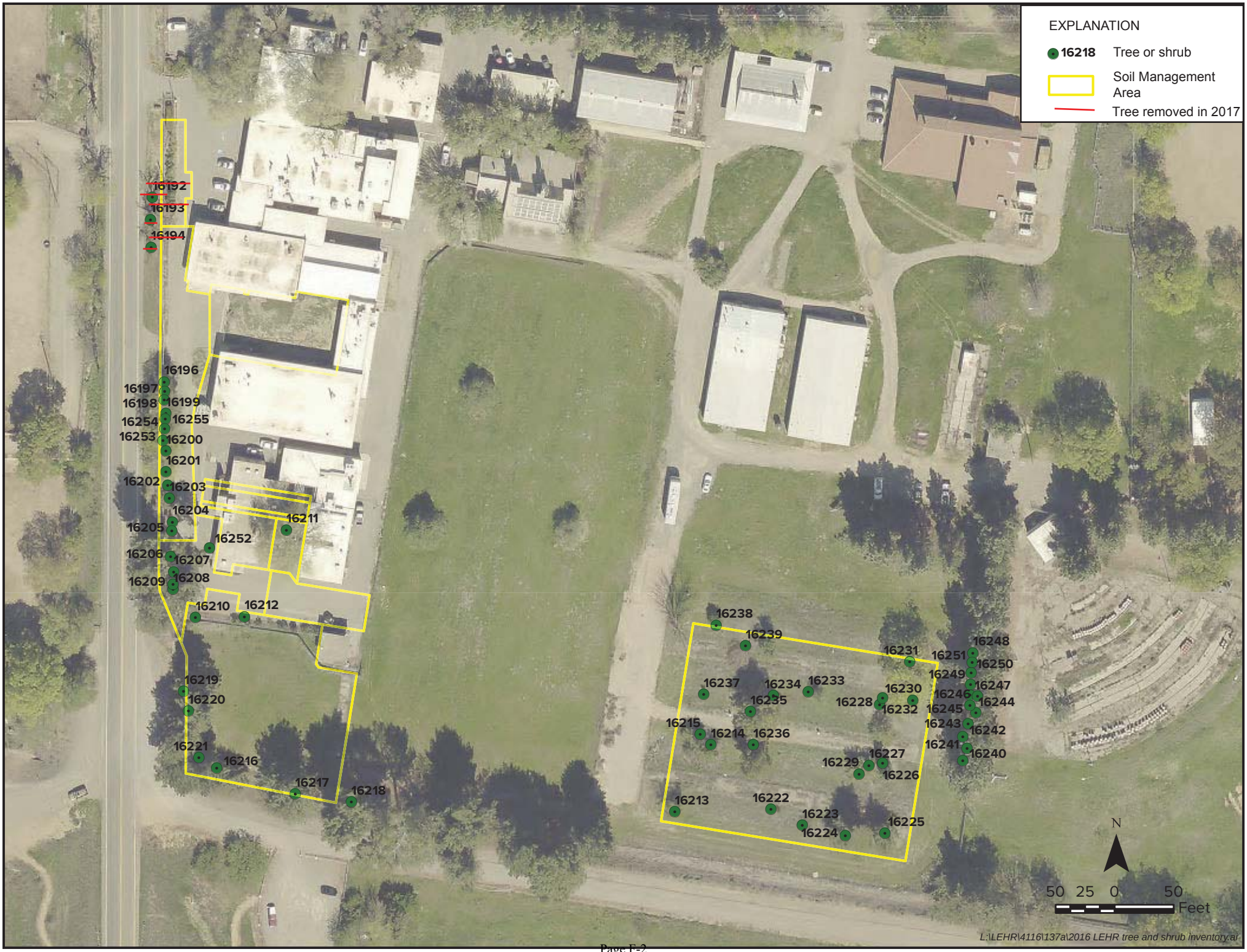

Figure 1. Trees and Shrubs with Canopies within DOE Areas (modified from version provided by UC Davis Facilities Management to focus on DOE Areas and to indicate trees removed in 2017)

	Tree ID	Assessment Date	Genus	Species	Common Name	DBH (cm)	Height (m)	# of Stems	Condition (Notes)
~~1~~	~~16192~~	~~11/4/2016~~	~~Juglans~~	~~bindsil~~	~~California Black Walnut~~	~~67~~	~~5-10~~	~~1~~	~~Poor (dead tree).~~ **Removed in 2017 (see Attachment F-1)**
~~2~~	~~16193~~	~~11/4/2016~~	~~Juglans~~	~~bindsil~~	~~California Black Walnut~~	~~64~~	~~5-10~~	~~1~~	~~Poor (tree canopy is 95% dead with severe mistletoe)~~ **Removed in 2017 (See Attachment F-1)**
~~3~~	~~16194~~	~~11/4/2016~~	~~Juglans~~	~~ninosii~~	~~California Black Walnut~~	~~57~~	~~5-10~~	~~1~~	~~Poor (dead tree).~~ **Removed in 2017 (See Attachment F-1).**
~~4~~	~~16195~~	~~11/4/2016~~	~~Morus~~	~~alba~~	~~White Mulberry~~	~~126~~	~~16-20~~	~~1~~	~~Fair (vigorous growth; history of branch failure; moderate branch decay; excessive canopy weight)~~ **Not adjacent to DOE Area**
5	16196	11/4/2016	Olea	europaea	Olive	13	5-10	2	Good (minor dead branches; structurally sound, but needs corrective pruning to improve branching structure)
6	16197	11/4/2016	Olea	europaea	Olive	13	5-10	2	Good (structurally sound, but needs corrective pruning to improve branching structure)
7	16198	11/4/2016	Celtis	sinensis	Chinese Hackberry	22	11-15	1	Good (vigorous growth; structurally sound; infested with Hackberry Woolly Aphid)
8	16199	11/4/2016	Olea	europaea	Olive	9	<5	4	Good (structurally sound, but needs corrective pruning to improve branching structure)
9	16200	11/4/2016	Celtis	sinensis	Chinese Hackberry	30	11-15	1	Good (vigorous growth; 5-degree lean towards street; infested with Hackberry Woolly Aphid)
10	16201	11/4/2016	Celtis	sinensis	Chinese Hackberry	24	11-15	2	Fair (vigorous growth; multi-trunked with included bark; minor dead branches; infested with Hackberry Woolly Aphid)
11	16202	11/4/2016	Nerium	oleander	Oleander	4	<5	11	Good (vigorous growth)
12	16203	11/4/2016	Nerium	oleander	Oleander	2	<5	11	Good (vigorous growth)
13	16204	11/4/2016	Pinus	halepensis	Aleppo Pine	70	16-20	1	Fair (vigorous growth; 15-degree lean towards building; history of large branch failure)
14	16205	11/4/2016	Pinus	halepensis	Aleppo Pine	79	16-20	1	Fair (vigorous growth; 15-degree lean towards street; excessive canopy weight)
15	16206	11/4/2016	Pinus	halepensis	Aleppo Pine	48	11-15	1	Fair (vigorous growth; 30-degree lean towards street; minor decay at root crown)
16	16207	11/4/2016	Pinus	halepensis	Aleppo Pine	66	16-20	1	Fair (vigorous growth; 10-degree lean southward; excessive canopy weight)
17	16208	11/4/2016	Pinus	halepensis	Aleppo Pine	68	16-20	1	Fair (vigorous growth; 10-degree lean towards street; excessive canopy weight; conflict with fence and light post)
18	16209	11/4/2016	Nerium	oleander	Oleander	2	<5	11	Good (vigorous growth)
19	16210	11/4/2016	Pinus	halepensis	Aleppo Pine	7	<5	1	Good (vigorous growth)
20	16211	11/4/2016	Morus	alba	White Mulberry	107	16-20	1	Fair (vigorous growth; risk of branch failure due to excessive canopy weight)
21	16212	11/4/2016	Nerium	oleander	Oleander	2	<5	11	Good (vigorous growth)
22	16213	11/4/2016	Prunus	dulcis	Almond	30	5-10	1	Fair (minor dead branches; poor branching structure)
23	16214	11/4/2016	Sambucus	nigra	Elderberry	20	<5	11	Poor (tree 75% dead; severe trunk decay; major dead branches) **No current plans for removal**.
24	16215	11/4/2016	Sambucus	nigra	Elderberry	22	<5	11	Poor (tree 60% dead; major branch failure) **No current plans for removal**
25	16216	11/5/2016	Pinus	halepensis	Aleppo Pine	55	5-10	1	Fair (vigorous growth; 45-degree lean east; excessive canopy weight)
26	16217	11/5/2016	Pinus	halepensis	Aleppo Pine	96	16-20	1	Good (vigorous growth; excessive canopy weight)
27	16218	11/5/2016	Pinus	halepensis	Aleppo Pine	92	16-20	1	Good (vigorous growth)
28	16219	11/5/2016	Pinus	halepensis	Aleppo Pine	68	16-20	1	Good (vigorous growth)
29	16220	11/5/2016	Pinus	halepensis	Aleppo Pine	61	16-20	1	Fair (vigorous growth; 10-degree lean; history of branch failure; excessive canopy weight)
30	16221	11/5/2016	Pinus	halepensis	Aleppo Pine	89	16-20	1	Fair (vigorous growth; co-dominant trunks with included bark; excessive branch weight)
31	16222	11/5/2016	Sambucus	nigra	Elderberry	3	<5	11	Good (vigorous growth)
32	16223	11/5/2016	Fraxinus	sp.	Ash species	7	<5	3	Good (vigorous growth)
33	16224	11/5/2016	Pinus	halepensis	Aleppo Pine	60	11-15	1	Good (vigorous growth; co-dominant leaders; excessive branch weight)
34	16225	11/5/2016	Pinus	halepensis	Aleppo Pine	47	11-15	2	Fair (vigorous growth; 5-degree lean; excessive branch weight; 2 trunks girdling each other; fluxing on trunk)
35	16226	11/5/2016	Pinus	canariensis	Canary Island Pine	28	11-15	1	Good (vigorous growth; co-dominant leaders)
36	16227	11/5/2016	Pinus	halepensis	Aleppo Pine	21	5-10	1	Fair (vigorous growth; poor branching structure; excessive branch weight)
37	16228	11/4/2016	Prunus	dulcis	Almond	25	<5	11	Poor (tree has toppled due to severe trunk rot; mix of dead branches and new growth) **No current plans for removal**
38	16229	11/5/2016	Pinus	halepensis	Aleppo Pine	28	<5	1	Fair (vigorous growth; 30-degree; excessive branch weight; fluxing from trunk)
39	16230	11/5/2016	Pinus	canariensis	Canary Island Pine	20	5-10	1	Good (vigorous growth)
40	16231	11/5/2016	Celtis	sinensis	Chinese Hackberry	44	5-10	2	Fair (vigorous growth; co-dominant trunks with included bark; minor dead branches)
41	16232	11/4/2016	Prunus	dulcis	Almond	9	<5	2	Fair (co-dominant trunks with included bark)
42	16233	11/5/2016	Sambucus	nigra	Elderberry	10	<5	11	Poor (severe trunk decay; major dead branches)
43	16234	11/5/2016	Pinus	halepensis	Aleppo Pine	2	<5	1	Good (vigorous growth; co-dominant leaders)
44	16235	11/5/2016	Pinus	halepensis	Aleppo Pine	53	11-15	1	Good (vigorous growth; 5-degree lean)
45	16236	11/5/2016	Pinus	halepensis	Aleppo Pine	52	11-15	1	Fair (vigorous growth; co-dominant trunks)
46	16237	11/5/2016	Sambucus	nigra	Elderberry	4	<5	5	Good (growing vigorously; minor dead branches)
47	16238	11/5/2016	Sambucus	nigra	Elderberry	10	<5	11	Fair (vigorous growth; 15-degree lean; minor dead branches)
48	16239	11/5/2016	Sambucus	nigra	Elderberry	20	<5	11	Fair (severe trunk decay; major dead branches; new growth at branch tips)
49	16240	11/5/2016	Pinus	canariensis	Canary Island Pine	51	16-20	1	Good (vigorous growth; 5-degree lean)
50	16241	11/5/2016	Pinus	canariensis	Canary Island Pine	64	16-20	1	Fair (vigorous growth; co-dominant trunks with included bark)
51	16242	11/5/2016	Pinus	canariensis	Canary Island Pine	14	5-10	1	Good (vigorous growth)
52	16243	11/5/2016	Pinus	canariensis	Canary Island Pine	51	16-20	1	Good (vigorous growth; excessive branch weight)
53	16244	11/5/2016	Pinus	canariensis	Canary Island Pine	57	16-20	1	Good (vigorous growth; excessive branch weight)
54	16245	11/5/2016	Prunus	dulcis	Almond	10	<5	2	Fair (co-dominant trunks; 10-degree lean; minor dead branches)
55	16246	11/5/2016	Pinus	canariensis	Canary Island Pine	19	5-10	1	Good (vigorous growth; scaffold branch with included bark)
56	16247	11/5/2016	Pinus	canariensis	Canary Island Pine	35	11-15	1	Good (vigorous growth)
57	16248	11/5/2016	Pinus	canariensis	Canary Island Pine	46	16-20	1	Good (vigorous growth; co-dominant leaders)
58	16249	11/5/2016	Pinus	canariensis	Canary Island Pine	18	<5	1	Fair (vigorous growth; leader has 90-degree bend)

	Tree ID	Assessment Date	Genus	Species	Common Name	DBH (cm)	Height (m)	# of Stems	Condition (Notes)
59	16250	11/5/2016	Pinus	canariensis	Canary Island Pine	42	11-15	1	Good (vigorous growth)
60	16251	11/5/2016	Pinus	canariensis	Canary Island Pine	53	16-20	1	Good (vigorous growth; 5-degree lean)
61	16252	11/5/2016	Nerium	oleander	Oleander	2	<5	11	Good (vigorous growth)
62	16253	11/4/2016	Celtis	sinensis	Chinese Hackberry	12	5-10	1	Fair (co-dominant trunks with included bark; minor dead branches; infested with Hackberry Woolly Aphid)
63	16254	11/4/2016	Celtis	sinensis	Chinese Hackberry	45	11-15	1	Good (vigorous growth; minor dead branches; infested with Hackberry Woolly Aphid)
64	16255	11/4/2016	Nerium	oleander	Oleander	3	<5	11	Good (vigorous growth)

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Attachment F-1

2017 Walnut Tree Removal

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2017 Walnut Tree Removal

Prior to the 2018 Soil Management Plan (SMP) revision, which established procedures for managing trees and shrubs within the U.S. Department of Energy (DOE) areas of the former Laboratory for Energy-Related Health Research (LEHR) Federal Facility, three dead black walnut trees needed to be removed. Two of these trees were at the western boundary of the Dry Wells A–E area, and one was at the western boundary of the Radium/Strontium Treatment Systems area (see Figure 1 of the UC Davis plant survey letter [UC Davis 2016]). In the latter part of 2016, the Solano County Department of Resource Management, Public Works Division (the County) indicated its plans to remove these three trees, along with a number of other dead trees lining Old Davis Road south of Interstate 80.

Because the SMP did not include procedures for addressing the removal of trees at that time, a separate Tree Sampling Plan (DOE 2017) was prepared and implemented. On December 12 and 16, 2016, sampling and analysis of the three trees adjacent to DOE Areas and two similar trees in locations representative of background conditions was conducted to determine if the dead trees contained radionuclide or metal concentrations that would require restrictions on reuse or disposal of the wood.

On the basis of the tree sampling results (Weiss 2017), the dead trees did not contain radionuclide or metal concentrations that would require restrictions on reuse or disposal of the wood. No California or Resource Conservation and Recovery Act hazardous waste levels were exceeded, no evidence of added radiological constituents was detected, and metal concentrations appear to be representative of typical background variability. Therefore, the trees were removed by the County with no restrictions on their disposal or reuse.

References

DOE (U.S. Department of Energy), 2017. *Draft Tree Sampling Plan, Laboratory for Energy-Related Health Research, California, Site*, LMS/LEH/S15500, Office of Legacy Management January.

UC Davis (University of California, Davis), 2016. Letter from Melanie Gentles, UC Davis Campus Arborist, Facilities Management, Buildings & Grounds, regarding plant survey at the LEHR site on the UC Davis Campus, November 7.

Weiss (Weiss Associates), 2017. Memorandum from Bob Devany/Mary Stallard, Weiss Associates, to Mike Butherus, Navarro, *Re: Results of Tree Sampling near DOE Areas,* February 7.

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