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U.S. Department of Energy

Oakland Operations Office, Oakland, California

FINAL
ANNUAL SITE ENVIRONMENTAL REPORT
CALENDAR YEAR 1997

for the

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

Submitted to:

United States Department of Energy
Oakland Operations Office
1301 Clay Street
Oakland, California 95612-5208

Prepared by:

Weiss Associates
5500 Shellmound Street
Emeryville, California 94608

September, 1998
Rev. 0

DOE Oakland Operations Contract DE-AC03-96SF20686

Weiss Associates
Environmental and Geologic Services

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SUBJECT: 1997 Site Environmental Report (SER) for the Laboratory for Energy-Related Health Research (LEHR)

This report, prepared by Weiss Associates (WA) for the U.S. Department of Energy, Oakland Operations Office (DOE/OAK), provides a comprehensive summary of the environmental protection activities at the Laboratory for Energy-Related Health Research (LEHR) for Calendar Year 1997. Site Environmental Reports (SERs) are prepared annually for all DOE sites with significant environmental activities, and distributed to relevant external regulatory agencies and other interested organizations or individuals.

To the best of my knowledge, this report accurately summarizes the results of the 1997 environmental monitoring and restoration program at LEHR. This assurance can be made based on DOE/OAK and WA review of the SER, and quality assurance protocols applied to monitoring and data analyses at LEHR.

A reader survey form is provided with the SER to provide comments or suggestions for future versions of the report. Your response is appreciated. Questions or comments regarding this report may also be made directly to DOE/OAK, by contacting Steve Black of the Environment, Safety, and Health Division at (510) 637-1595, or by mail to the address above.

Sincerely,

James T. Davis
Assistant Manager for
Environmental Management

CERTIFICATION OF ACCURACY FOR:

ANNUAL SITE ENVIRONMENTAL REPORT, 1997, FOR LEHR

I certify that the information submitted herein is true, accurate, and complete, based on my familiarity with the information and my inquiry of those individuals immediately responsible for obtaining the information.

Signature: Robt O. Devany Date: 9-30-98
Robert O. Devany, Project Manager

ENVIRONMENTAL REPORT
READER SURVEY

To Our Readers:

Each annual Environmental Report publishes the results of environmental monitoring at the Former Laboratory for Energy-Related Health Research (LEHR) and documents our compliance with environmental regulations. In providing this information, our goal is to give our readership — whether they be regulators, scientists, or the public — a clear accounting of the range of environmental activities we undertake, the methods we employ, and the degree of accuracy of our results.

It is important that the information we provide is easily understood, is of interest, and communicates the Department of Energy's effort to protect human health and the environment. We would like to know from you, our readers, whether we are successful in these goals. Your comments are welcome.

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ACRONYMS AND ABBREVIATIONS

AEC	Atomic Energy Commission
AH-1	Animal Hospital 1
AH-2	Animal Hospital 2
ANSI	American National Standards Institute
ASER	Annual Site Environmental Report
ATSDR	Agency for Toxic Substances and Disease Registry
BHC	Hexachlorocyclohexane
BI	Background Soil Investigation
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
Ci	Curie
COC	Constituent-of-Concern
Co-60	Cobalt-60
CVRWQCB	Central Valley Regional Water Quality Control Board
DCG	Derived Concentration Guide
D&D	Decontamination and Decommissioning
DHS	California Department of Health Services
DOE	U.S. Department of Energy
DCE	Dichloroethene
DGI	Data Gaps Investigation
DTSC	California Department of Toxic Substances Control
EE/CA	Engineering Evaluation/Cost Analysis
EPA	U.S. Environmental Protection Agency
ER/WM	Environmental Restoration
ESA	Endangered Species Act
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
g	Gram

GEL	General Engineering Laboratories
H-3	Tritium
HSU	Hydrostratigraphic Unit
ITEH	Institute Toxicology and Environmental Health (UC Davis)
l	Liter
LAS	Lockheed Analytical Services
LEHR	Laboratory for Energy-Related Health Research
LFI	Limited Field Investigation
LTRAS	Long Term Research Acquisition Site
m^3	Meter cubed
MCL	Maximum Contaminant Level
MDA	Minimum Detectable Activity
MEI	Maximally Exposed Individual
mg	milligram
MOA	Memorandum of Agreement
mR	milliroentgen
mrem	millirem
MSDS	Material Safety Data Sheets
mSv	millisievert
MWSF	Mixed Waste Storage Facility
ND	Not Detected
NEPA	National Environmental Policy Act
NESHAP	National Emission Standard for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NQA	National Quality Assurance
NTU	Nephlometric Turbidity Units
OAK	Oakland Operations Office
ORI	Off-Site Radium-226 Investigation
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyl

PCD	Putah Creek Downstream
pCi/m^3	picoCurie per cubic meter
PCU	Putah Creek Upstream
pH	potential of Hydrogen
PM-10	Respirable Particulate Matter
PNA	Polynuclear Aromatic Compound
PNNL	Pacific Northwest National Laboratory
PRG	Preliminary Remediation Goal
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RA	Removal Action
Ra-226	Radium-226
RBAS	Risk Based Action Standards
RCRA	Resource Conservation and Recovery Act
rem	Roentgen Equivalent Man
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
RPM	Remedial Project Manager
RWQCB	Regional Water Quality Control Board
SOP	Standard Operating Procedures
Sr-90	Strontium-90
STOP	Wastewater (Sewage) Treatment Plant Outfall
SVOC	Semivolatile Organic Compound
TCE	Trichloroethene
TLD	Thermoluminescent Dosimeter
TSCA	Toxic Substances Control Act
UC Davis	University of California at Davis
µCi	microcurie
µg/l	micrograms per liter
VOC	Volatile Organic Compound
WA	Weiss Associates

WDR	Waste Discharge Requirements
YSAQMD	Yolo-Solano Air Quality Management District

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SUMMARY

This Annual Site Environmental Report (ASER) for the Laboratory for Energy-Related Health Research (LEHR) Site (the Site) includes 1997 environmental monitoring data for Site air, soil, ground water, surface water, storm water and ambient radiation. The U.S. Department of Energy (DOE) operation of LEHR as a functioning research location ceased in 1989, after the completion of three decades of research on the health effects of low-level radiation exposure (primarily strontium-90 and radium-226), using beagles to simulate effects on human health. During 1997, the U.S. DOE continued activities at the Site in support of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Environmental remediation. Extensive environmental data were collected in 1997 to evaluate appropriate remedial actions for the Site.

Environmental monitoring for the Site in 1997 was conducted according to the *Site Environmental Monitoring and Surveillance Plan* (Weiss Associates, 1997h), and *the Site Water Monitoring Plan* (DOE, 1992b). This annual report presents environmental data for each of these activities. Some of the data are still preliminary since some of the studies are ongoing and final reports have not yet been issued. Because data quality objectives required under CERCLA are more extensive than those required for the Site Environmental Monitoring and Surveillance Plan, the procedures for collection of air, soil and water data were incorporated into the CERCLA environmental restoration process. A revised Site Environmental Monitoring and Surveillance Plan to define appropriate requirements for collection of this information was issued in Draft form in 1997 (Weiss Associates, 1997h).

Progress of Site Environmental Restoration and Overview of 1997 Monitoring Results

Site restoration activities are conducted with close coordination between the U.S. Environmental Protection Agency (EPA), the DOE, the University of California at Davis (UC Davis), and the involved state agencies including the Department of Toxic Substance Control (DTSC), the Central Valley Regional Water Quality Control Board (CVRWQCB), and the Department of Health Services (DHS). In 1997, DOE and UC Davis finalized a Memorandum of Agreement (MOA) dividing responsibility for Site operable units (DOE, 1997a).

DOE activities at the Site in 1997 primarily focused on additional soil characterization and development of remedial solutions. Significant progress was made during the year toward the characterization of Site air, soil, and water to meet the remaining data requirements and for evaluation of removal action options.

- ***Domestic Septic Tank Systems:*** Additional investigation of the domestic septic tank systems indicated that radium-226, uranium-235, cesium-137, barium, total chromium, hexavalent chromium, cadmium, lead, and mercury were detected above the Risk Based Action Standard (RBAS) as defined in Section 2.15. Tritium was detected at activities greater than three times the background level.

Cesium-137, uranium-235, nitrate, zinc, mercury, are present in some areas at concentrations between two and three times the background level. Radium-226, bismuth-214, thallium-208, uranium-235, gross alpha, arsenic, cadmium, hexavalent and total chromium, copper, iron, lead. manganese, nickel, vanadium, 1,2-dichloroethene (1,2-DCE), trichloroethene (TCE) and aroclor-1254 were detected at concentrations less than twice background.

- ***Dog Pens Investigation:*** A historical review, gamma surveys, and soil and gravel sampling in the western dog pens were conducted. These studies indicate that surface "hot spots" of radium-226 and chlordane are present. These "hot spots" are few, appear to be smaller than 1.2-ft radius, and may be present throughout the western dog pens. The maximum radium-226 activity was 1.94 pCi/g, less than three times the background of 0.75 pCi/g.
- ***Background Soil Investigation:*** Six soil borings were drilled at the Site to furnish supplemental data to be used in developing statistically defensible background levels. These data were used to refine soil background estimates for radionuclides, metals and nitrate.
- ***Offsite Radium-226 Investigation:*** Soil samples were collected along Old Davis Road near the former Radium-226 leach field and dry wells. Radium-226 was detected at a maximum activity of 1.28 pCi/g, slightly above the background level of 0.75 pCi/g. Chlordane was detected at a maximum of 93.4 µg/kg at four of the eight sampling locations, and 4,4-DDT was detected at a maximum of 52.4 µg/kg in surface samples collected at five locations.

The 1997 water monitoring continued the extensive program applied in previous years. The results of the water monitoring program are similar to previous years, and are summarized below.

- ***Ground Water:*** Ten radionuclides, including tritium, were detected above the minimum detectable activity (MDA) but below the maximum contaminant level (MCL) in Site wells. Tritium was detected at a maximum of 19,400 piC/l in well UCD1-13. Chloroform was detected at 150 µg/l or less in many onsite wells, and at a maximum of 7,900 µg/l in UCD1-012. Nine other VOCs were detected at low concentrations (18 µg/l or less). Seven semi-volatile organic compounds were detected at concentrations of up to 8.4 µg/l. Eight pesticides were reported at up to 0.017 µg/l. No PCBs were detected. Sixteen metals were detected in Site ground water. Total dissolved solids, turbidity, and nitrate concentrations are above the MCL in many wells. Nitrate concentrations in wells UCD1-10 and UCD1-24 appear to be increasing.
- ***Surface Water:*** No radionuclides were detected above the MDA in surface water. Six VOCs, one SVOC, twelve metals, five pesticides and no PCBs were detected in surface water samples. None of these compounds exceeded their MCL.

- ***Storm Water:*** Five radionuclides were detected above the MDA, but below the MCL in storm water samples. Four VOCs and two pesticides were detected below their MCLs. Metals were detected in all samples, and five metals (antimony, chromium, iron, manganese and nickel) were detected at concentrations exceeding their MCL.

The 1997 sampling results confirm previous findings that elevated levels of chloroform, tritium, chromium and nitrate are present in Site ground water. Chromium and nitrate occur in regional ground water, and do not appear to be solely attributable to Site activities.

A reduced air monitoring program was implemented in January 1997 to monitor radionuclides present in Site ambient air. The results of the radionuclide air monitoring program are similar to previous years, and are summarized below:

- ***Radionuclides in Air:*** Total alpha and beta activities detected at the Site were similar to offsite background levels. Elevated alpha and beta activities were detected both on and off-site in October and December of 1997. All gamma-emitting radionuclides detected were well below the DOE Derived Concentration Guides (DCGs). The average radon activity detected on-site was lower than the average detectable off-site radon activity and below the DOE DCG of 3.0 pCi/l.

Assessment of Radiological Impact of LEHR Environmental Restoration Project

1997 DOE Site activities consisted primarily of monitoring and planning for 1998 removal activities and had very little impact on current Site conditions. The radiological air and ambient data generally indicate that the low radionuclide activities detectable at the Site in 1997 are near or below natural background levels, and do not pose a risk to Site workers or the general public (Weiss Associates, 1998f).

1. INTRODUCTION

This Annual Site Environmental Report (ASER) describes DOE activities for the Environmental Restoration/Waste Management (ER/WM) Project at the Laboratory for Energy-Related Health Research (LEHR) site at UC Davis California (Figure 1-1). The report provides information about the Site and its environmental monitoring operation throughout calendar year 1997 for both radiological and non-radiological parameters. This report also describes activities conducted during 1997 in support of the Site environmental restoration efforts, and information about the impact of these activities on the public and the environment.

1.1 History

The Atomic Energy Commission (AEC) first sponsored radiological studies on laboratory animals at UC Davis in the early 1950s. Initially situated on the main campus, LEHR was established in 1958 at its present location (Figure 1-1) by the AEC. Research at LEHR through the mid-1980s focused on the health effects from chronic exposures to radionuclides, primarily strontium-90 and radium-226, using beagles to simulate radiation effects on humans. Other related research was conducted at the Site concurrent with these long-term studies. In the early 1970s, a cobalt-60 (Co-60) irradiator facility was constructed on the Site to study the effects on beagles of chronic exposure to gamma radiation.

Two campus landfills, used from the 1940s until the mid-1960s, are located at the Site. Several low-level radioactive waste burial areas are also present at the Site. Campus and LEHR research waste were buried in these areas until 1974, in accordance with regulations in effect at the time.

In 1988, pursuant to a Memorandum of Agreement (MOA) between DOE and the University of California, DOE's Office of Energy Research initiated activities to close out the research program at LEHR, with the goal of returning the facilities and land to UC Davis after remediation is complete.

1.1.1 Environmental Restoration

The U.S. Department of Energy Oakland Operations Office (DOE-OAK) manages the environmental restoration of the DOE-impacted areas of the Site. From October 1989 through February 1990, an interim contract with UC Davis was implemented to begin Site restoration. From 1990 to 1996 Battelle Environmental Management Operations provided LEHR ER/WM project management. In 1996 ER/WM project implementation was transferred to Weiss Associates (WA) of Emeryville, California.

In May 1994, the U.S. Environmental Protection Agency (EPA) added the Site to the National Priorities List. A Site Remedial Investigation and Feasibility Study (RI/FS) work plan was developed to ensure that investigation and remediation are conducted in accordance with regulatory requirements. Remedial Project Managers (RPM) meetings were held monthly during 1997 to evaluate the progress of remediation and identify actions needed to facilitate the process. A draft Federal Facility Agreement has been prepared and is being discussed with the U.S. EPA and state agencies.

Primary restoration/remediation activities which have been or will be performed at the LEHR Site include: soil and ground water characterization, building assessment, Decontamination and Decommissioning (D&D) of above-ground structures, waste management, chemical and radiological risk assessment, and remediation of DOE-contaminated trenches, soil, and underground tanks. Project management, health and safety, and quality assurance are components of all actions undertaken.

1.2 Site Description

The Site is a 15-acre parcel owned by the Regents of the University of California. It is 1.5 miles south of the main UC Davis campus in a rural agricultural area (Figure 1-1). The Site is presently occupied by the UC Davis Institute of Toxicology and Environmental Health (ITEH). Research at ITEH is directed towards toxicology, epidemiology, radiation biology, and radiochemistry.

The Site consists of 15 buildings, including a main administration and office building, two animal hospitals, and a laboratory and support buildings. Historical use of specific facilities and/or areas at the Site has left an environmental impact, which is being investigated and remediated. Former facilities include: radioactive fluid waste treatment systems, indoor/outdoor Co-60 beam irradiator, a radioactive waste burial area, animal hospitals, and outdoor dog pens. Potential environmental impacts from the inactive campus landfill units and numerous inactive campus low-level radioactive disposal sites (trenches and holes) used by UC Davis and DOE to dispose waste are also being evaluated for remediation by UC Davis. Figure 1-2 shows areas that have potentially impacted the environment at the Site.

Known and potentially impacted areas of the Site are shown in Figure 1-2. Soil sampling was performed in these areas in 1997 to characterize environmental impacts, guide further investigation, and provide information to support informed risk management decisions in planning remedial action. Sampling was also conducted outside the impacted areas in 1997 to investigate possible off-site impacts and to refine calculated background levels for specific constituents-of-concern (COCs). Revised background values have been established for radionuclides, metals, and nitrate (Weiss Associates, 1998g).

1.3 Population Data

1.3.1 Site Population

Currently, the Site is used by UC Davis and DOE to support ongoing research and remediation. UC Davis' ITEH consists of several facilities on the Site where research is conducted. ITEH activities involve approximately 200 university researchers and support staff. ITEH researchers and student assistants have varying schedules and are not all present at the Site at the same time.

The DOE LEHR ER/WM Project is currently managed and staffed by WA and their subcontractors. Total LEHR ER/WM Project on-site personnel currently includes up to six full-time workers. This number will change as on-site work progresses on scheduled remediation and waste management projects.

1.3.2 Local Population

The Site is located in a rural area in northeast Solano County just outside of Davis, California. UC Davis has a student population of approximately 22,000 and employs approximately 15,000 full-time faculty and staff. The current population of Davis is approximately 53,000 and the current total population of Yolo County is about 150,000. The more densely populated and metropolitan Sacramento area is approximately 12 miles east of the Site. The current population of Sacramento County is about 1,150,000, and approximately 396,000 people live in the city of Sacramento.

1.4 Environmental Setting

The Site is located on a flat plain bordered on the south by the northern levee of the south fork of Putah Creek. The Site property is flat and mostly open, with a few trees and bushes. The Site lies outside the 100-year floodplain.

1.4.1 Land Use

The land within a one-mile radius of the Site is owned both privately and by UC Davis. It is used for animal research, agriculture, and recreation (fishing and swimming). Privately owned lands toward the south and east of the Site include permanent residences and are used to produce wheat, tomatoes, corn, barley, and oats. Private property to the south is separated from the Site by the south fork of Putah Creek; property to the east is adjacent to non-LEHR, UC Davis-owned research facilities. The property immediately west, north and south (Putah Creek Reserve) of the Site is owned by UC Davis and is currently used for various types of animal, agricultural, and health research.

1.4.2 Meteorology/Air Quality

The local climate is Mediterranean, with mild winters and long summers. In winter, the average temperature is 47 degrees Fahrenheit (°F), and the average daily minimum temperature is 37°F. In summer, the average temperature is 73.0 °F and the average daily maximum temperature is 92°F. The mean annual precipitation is 17.0 inches, most of which occurs between October and April (DOE, 1996).

The Site is located in the Sacramento Valley Air Basin, which has a very high air pollution potential when weather conditions do not favor adequate dispersion. Extensive agricultural, industrial and urban development, combined with topographic and meteorological conditions that often reduce atmospheric dispersion, can allow pollutants to reach relatively high levels at times during the year.

The sun shines approximately 95% of the time in summer and about 45% in winter. The prevailing wind direction is from the south, reflecting frequent incursion of marine air through the Carquinez Strait into the Sacramento Valley. Several times a year, strong winds blow from the north, generally following the passage of Pacific storm systems (DOE, 1994a).

1.4.3 Topography

The regional topography is typical of the relatively flat Sacramento Valley (Figure 1-1). The Sacramento River, the primary drainage of the Sacramento Valley, is approximately 12 miles east of the Site. The Site is located in the flat-lying Putah Plain area. Average Site elevation is approximately 50 feet above mean sea level. Relief across the Site is about 2 feet, with the lowest portion in the area of the former Co-60 irradiation field (DOE, 1992b).

1.4.4 Hydrogeology

The hydrogeology of the Sacramento Valley is characterized by both unconfined and confined aquifers in the near flat-lying or gently sloping sedimentary deposits in the upper 3,000 feet beneath the valley. No regionally-identified confining units exist in the Sacramento Valley.

The major ground water sources for public and private water supplies in the Sacramento Valley are unconsolidated deposits of Pliocene and Pleistocene age, and older alluvium (Dames & Moore, 1993).

The first regional aquifer beneath the Site has been divided into two hydrogeologic units, based on differences in composition. The uppermost unit, extending from ground surface to a depth of about 80 feet, has been identified as hydrostratigraphic unit one (HSU-1). It consists predominantly of fine-grained alluvial-fan sediments composed of clayey silt, sandy silt, and silty fine sand with thin beds or lenses of sand and/or gravel.

The deeper part of the first aquifer, ranging from about 80 feet below ground surface to 125 feet, is known as hydrostratigraphic unit two (HSU-2). This unit consists of relatively coarse-

grained alluvial fan sediments, including sand, gravel and cobble-sized sediments. This unit is laterally continuous on a regional scale and represents the first major aquifer underlying the Davis area. This lateral continuity is an important distinction between the first and the second HSUS. Within HSU-1, the ground water gradient is primarily vertical and its recharge is largely dependent upon HSU-2 (DOE, 1996).

1.4.5 Water Supply and Quality

Ground water in the vicinity of the Site is used for agricultural and domestic supply. Regional ground water quality has been impacted by nitrates, probably from agricultural sources, and by hexavalent chromium, probably from natural sources (Dames and Moore, 1997a).

Local ground water is recharged by streams and rivers, and direct infiltration from precipitation and irrigation. At the Site, recharge rates are highest immediately after precipitation events that cause a rise in the level of nearby Putah Creek. Within a day after a heavy precipitation event, continuous water level measuring equipment located in monitoring wells near the creek show a significant increase, (DOE, 1996).

1.4.6 Sanitary Sewer Systems

The Site discharges its sanitary wastewater to the UC Davis Wastewater Treatment Plant. UC Davis operates the plant under the conditions specified in its National Pollutant Discharge Elimination System (NPDES) permit, granted by the EPA in conjunction with the CVRWQCB.

1.4.7 Storm Drainage System

Storm water runoff at the Site is controlled through an underground drainage system that feeds into two collection points on the Site. Storm water from the paved area in the west part of the Site and around the southern buildings in the western area is collected in a storm water drainage system. The drainage system flows to the Site storm water lift station (LS-1 on Figure 2-1) and then to an outfall along the west side of the Old Davis Road, where it is discharged to Putah Creek. Storm water in the northwestern area of the Site drains into a ditch along Old Davis Road. Storm water in the eastern and non-paved southern portions of the Site percolates into the soil, except for a section of the former Co-60 field where dog pens were once located, and where drainage is connected to the sanitary sewer. Water collects in shallow ponds during heavy rains in some areas of the Site.

1.4.8 Biological Resources

A number of sensitive biological resources were identified in the Ecological Scoping Assessment (Weiss Associates, 1997j), as potentially occurring in the vicinity of the project Site. These species include the Giant Garter Snake, the Northern Harrier, the Coopers Hawk, the California Horned Lark, the Great Egret, the Burrowing Owl, and the Valley Elderberry Beetle,

which lives in elderberry bushes. Although elderberry bushes are present at the site, a focussed biosurvey (IT, 1998) found no sensitive species actually present on-site and concluded that the on-site elderberry bushes are not currently hosting the Valley Longhorn Beetle.

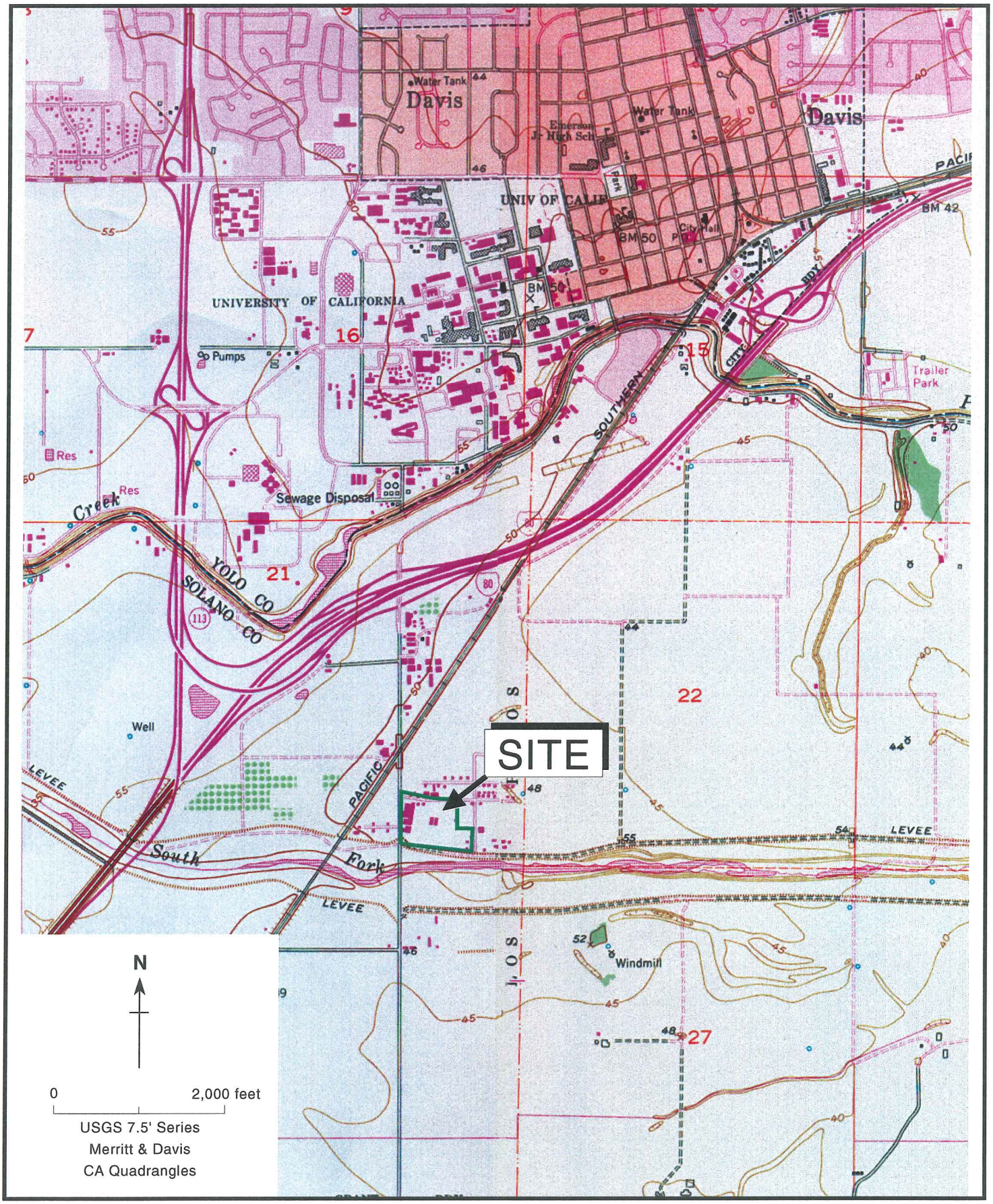

Figure 1–1. Location of the LEHR Site, UC Davis, California

Weiss Associates

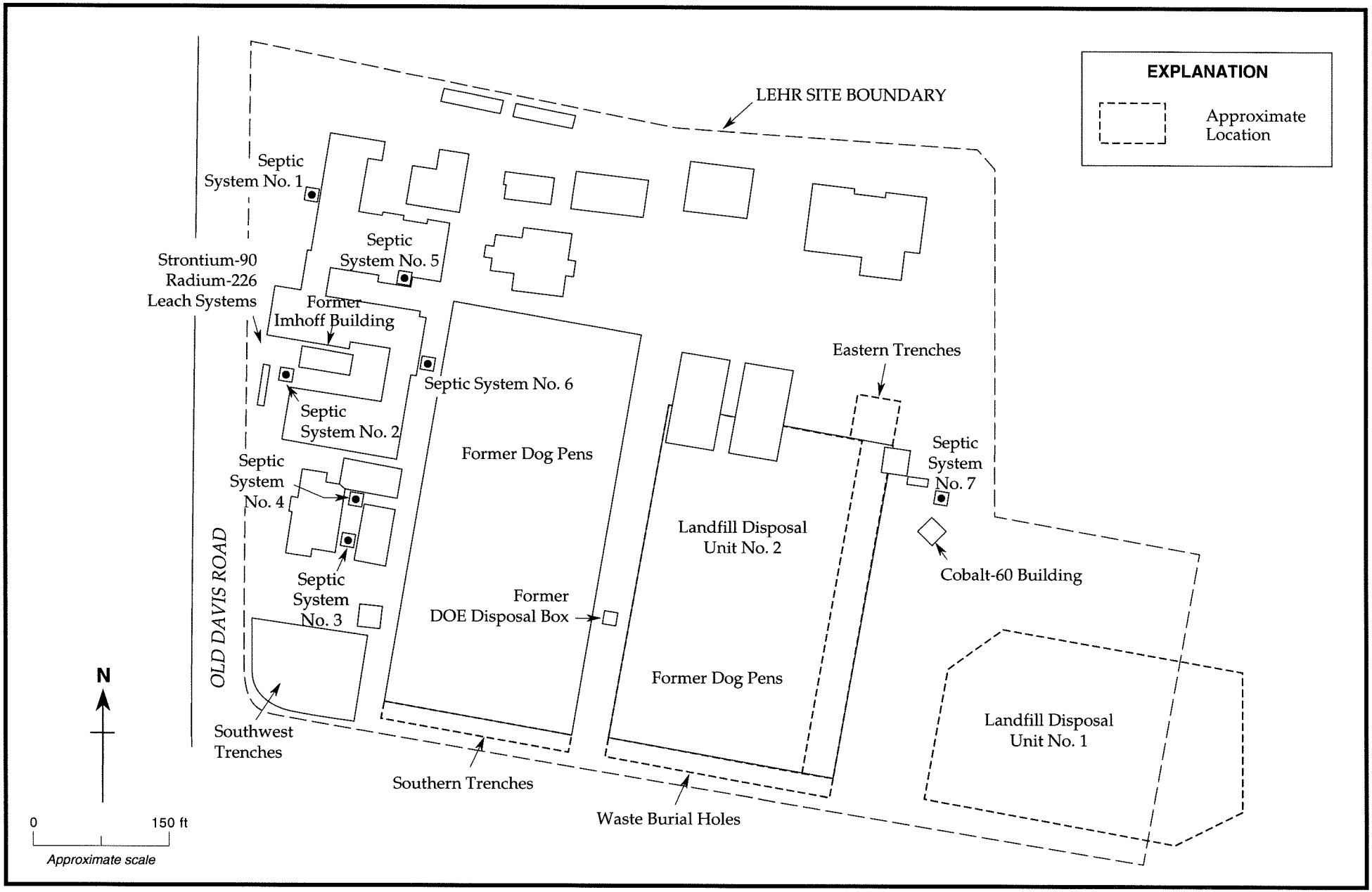

Figure 1-2. Site Features that May Have Impacted the Environment, LEHR Site, UC Davis, California

Weiss Associates

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2. COMPLIANCE SUMMARY

This compliance summary provides an overview of primary environmental regulatory compliance status for 1997 activities conducted at LEHR. DOE-funded work at the Site centered on environmental restoration and waste management. Evaluation of remedial alternatives and investigation activities for soil characterization were the primary focus for the year.

2.1 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

In 1995 a streamlined CERCLA process was initiated at the Site. The streamlined processes encourages an interactive remedial decision-making framework, wherein data are evaluated and clean-up actions are implemented in an ongoing process. Evaluation of remedial alternatives and remedial investigation activities conducted to further characterize Site soil and air were the primary focus of DOE 1997 CERCLA compliance actions. These activities included both shallow and subsurface soil sampling and ongoing air monitoring. Characterization efforts have been planned and implemented to assist in developing sufficient information for health risk evaluation as well as to support expeditious completion of necessary remedial actions. No CERCLA, Resource Conservation and Recovery Act (RCRA) or other violations, fines, or penalties were issued for the Site in 1997.

Progress of the Site restoration has been coordinated, directed and reviewed at monthly RPM meetings. The RPMs include representatives from the U.S. EPA, state agencies including the California Department of Toxic Substances Control (DTSC), the CVRWQCB, California Department of Health Services (DHS), and the Site project managers (DOE and UC Davis).

Community input and involvement has been encouraged under CERCLA. Through the assistance of an EPA-awarded Technical Assistance Grant, the Davis South Campus Superfund Oversight Committee was formed. Representatives from this group provide input at the monthly RPM meetings.

A MOA has been developed between DOE and UC Davis (DOE, 1997a) that divides responsibility between DOE and UC Davis for the Site according to historical information regarding use and operation.

2.2 Resource Conservation and Recovery Act (RCRA)

2.2.1 Site Treatment Plan for RCRA-regulated/Mixed Waste

The Federal Facilities Compliance Act of 1992 waives sovereign immunity for federal facilities for fines and penalties under the provisions of RCRA's hazardous and solid waste management requirements. It requires that a Site Treatment Plan be prepared for each DOE Site that generates or stores mixed waste. After completion of the California Environmental Quality Act (CEQA) Initial Study and public comment, a final Site Treatment Plan was approved and issued in October 1995. No modifications were made to this plan in 1997.

2.2.2 Mixed Waste Storage Facility

In 1989, UC Davis as operator and DOE as owner, submitted a Part A permit application to EPA for the on-site storage of mixed waste generated during the DOE-funded research work. The waste was stored in a mixed waste storage facility (MWSF) located in the eastern part of the Site. The MWSF consists of a pre-fabricated steel chemical storage building with three separate lockers. The facility was used to store mixed waste between 1989 and 1996.

All stored waste has been properly characterized, packaged and shipped to off-site locations for treatment or disposal, and the MWSF is now empty. A closure plan was submitted to DTSC in 1997, and facility closure is expected to be completed in 1998.

2.3 National Environmental Policy Act (NEPA)

In 1997, an Engineering Evaluation/Cost Analysis (EE/CA) was completed for the southwest trenches, radium-226/strontium-90 treatment systems, and domestic septic system areas (Weiss Associates, 1998a). The EE/CA reviews environmental impacts in a manner that is consistent with NEPA and with DOE environmental compliance guidelines, as required under NEPA.

Probable environmental impacts of all the EE/CA Removal Action (RA) alternatives were reviewed and it was found that, for the most part, the project will impact a relatively small area of previously-disturbed land, and the proposed activity will have little affect on environmental considerations. The EE/CA concluded that no long-term, significant, and adverse environmental impacts are likely to occur from any of the proposed RAs.

2.4 California Environmental Quality Act (CEQA)

No CEQA documentation was processed or required in 1997.

2.5 Clean Air Act

The LEHR Site does not currently have airborne effluent streams that require monitoring. The Site is subject to Yolo-Solano Air Quality Management District (YSAQMD) regulations. Currently, there are no sources on the Site that are subject to permits required by YSAQMD. Future plans for development of ground water treatment systems for the Site will need to incorporate evaluations for air pollution control permits that may be needed, in conjunction with the UC Davis campus Operating Permit required pursuant to Title V of the 1990 Clean Air Act Amendments.

Verification of compliance with clean air regulations is accomplished at the Site through several different methods. These methods include computer modeling to estimate potential fugitive wind-blown dust emissions from diffuse sources, and localized air monitoring during excavation or remediation of buildings. Site ambient air monitoring was conducted as a one-year baseline air sampling investigation. This investigation is expected to determine at what level normal Site activities and waste burial locations contribute to local airborne effluent.

As the various environmental restoration activities progress at the Site, the need for air monitoring is continually evaluated. The potential exists for some of the contamination in burial areas to become exposed during tests and excavation. Prior to the start of each phase of the project, an analysis is performed to determine required controls to reduce potential emissions and to evaluate air monitoring requirements. Monitoring data are collected during the activity to verify that controls are maintained and requirements are met.

2.5.1 National Emission Standards for Hazardous Air Pollutants (NESHAP)

The Site complies with 40 CFR Part 61 Subpart H – *National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Emissions of Radionuclides from DOE Facilities*. The NESHAP regulations require that radionuclide emissions not exceed levels that would result in an effective dose equivalent (EDE) of 10 millirem (mrem)/yr. To demonstrate compliance, an EDE may be calculated for the facility by applying models to estimate radionuclide air activities, or measurement of radionuclide air activities at critical receptor locations may be used as an alternative to air dispersion calculations. The EPA prefers the application of approved dispersion models that account for multi-pathway ingestion routes of radionuclides in ambient air resulting from facility emissions. The use of air monitoring data of radionuclide activities at critical receptor locations for use as an alternative to air dispersion calculations requires prior approval from the EPA.

No potential radionuclide emission point sources remain at the Site. The NESHAP requirements primarily target point source/stack emissions. However a Memorandum of Understanding between the DOE and the EPA (DOE, 1995d) applies the same criteria to potential diffuse area sources that are required of point sources.

Calculations were performed to determine the potential or estimated dose from Site sources to members of the public. These calculations were based on Site residual surface soil contamination (diffuse sources). No significant remediation activities resulting in elevated fugitive emissions were undertaken during 1997. The only potential sources of emissions on the Site during 1997 were re-entrainment and subsequent dispersion of surface soil dust containing potentially elevated concentrations of radionuclides. Estimated contributions to the annual Site EDE from nonpoint

source emissions (surface soils) are well below the NESHAP limit, as shown in Table 4-5. The potential radionuclide diffuse area sources at the Site are further discussed in Section 4.

An analysis of potential diffuse airborne radiological effluent sources at the Site was prepared for the 1997 Radionuclide Air Emission Annual Report (under Subpart H of 40 CFR Part 61). No changes to site conditions occurred during 1997 that would result in a change in estimated emissions. Additional surface soil data were collected in the Western Dog Pens, but these data did not indicate the presence of contamination exceeding the maximum levels identified in 1996. Revised background levels were established for the Site using additional data collected from new background soil borings in 1997. The revised background values for radionuclides do not differ substantially from values established earlier. These data could be used to refine the initial emission rates calculated during preparation of the 1996 Radionuclide Air Emission Annual Report; reductions in the estimated emissions rates would likely be less than an order of magnitude and would not add qualitatively to the current results.

The results of the potential diffuse airborne radiological effluent source dose assessment, completed in 1998, are presented in the 1997 Radionuclide Air Emission Annual Report (Weiss, 1998f), and are summarized in Section 4 of this report. The modeling was completed using an EPA approved DOE computer code, CAP88-PC, Version 1, based on estimated wind blown re-suspension of residual material contamination measured during Phase II Site Characterization and the Limited Field Investigation. Site areas included in the fugitive emissions modeling were the southwest trenches area, the radium-226 treatment system, the strontium-90 treatment system, and the western and eastern dog pen areas. Fugitive emissions modeling indicated that the maximum annual credible dose equivalent to a member of the public from residual contamination on the Site is less than 0.002 mrem.

2.6 National Pollutant Discharge Elimination System (NPDES)

Some surface water from the Site is directed to the UC Davis Wastewater Treatment Plant. Wastewater from this plant is discharged to the south fork of Putah Creek. This discharge is permitted by UC Davis under NPDES Permit #CA0077895 (EPA) and Waste Discharge Requirements (WDR) Order No. 92-040 (CVRWQCB).

2.7 Clean Water Act

The Site discharges its sanitary waste to the UC Davis Wastewater Treatment Plant which is subject to the conditions set forth in the NPDES permit CA0077895 and WDR Order No. 92-040, granted by the Regional Water Quality Control Board (RWQCB). DOE operations at the Site include no underground or above ground tanks that are subject to any county, state, or federal permit requirements.

Storm water runoff monitoring at the Site began in the fall of 1994. Storm water samples are collected twice a year: once at the beginning of the rainy season after the first storm of the season, and once near the end of the season. Grab samples were collected from three locations at the Site in 1997. Storm water sample locations are shown on Figure 2-1. Although the Site does not fall under the industrial categories subject to the State General Storm Water Permit requirements, the storm

water sampling program meets the State General Permit requirements, and is performed in accordance with the Site Water Monitoring Plan. Best management practices are also in use at the Site to minimize contamination in storm water runoff.

2.8 Safe Drinking Water Act/California Porter-Cologne Water Quality Control Act/California Safe Drinking Water and Toxics Enforcement Act (Proposition 65)

Current DOE activities of LEHR do not contribute to hazardous discharges. The two facilities at LEHR that historically released liquid effluents to the environment, the Imhoff treatment facility and the radium-226 septic system, have ceased operation and are included in planned remedial actions. DOE research operations at the Site were discontinued in 1989.

Quarterly monitoring of ground water and surface water has been conducted since November 1990 and focuses primarily on environmental surveillance activities for non-operational facilities as defined in DOE Order 5400.1. Ground water and surface water monitoring in 1997 were conducted under the Site Water Monitoring Plan (Dames and Moore, 1994). In 1998, water monitoring will be conducted under a revised Field Sampling Plan (Dames and Moore, 1997). The potential for ground water to be affected by previously utilized waste burial sites is being investigated as part of the CERCLA restoration effort.

DOE and UC Davis are working closely with EPA, DTSC, and the RWQCB to determine the extent of contamination and the remedial action(s) to be taken. In April 1997, UC Davis completed an Engineering Evaluation/Cost Analysis Ground Water Interim Removal Action, (Dames and Moore, 1997) to assess ground water plume mitigation and containment options.

2.9 Emergency Planning and Community Right to Know Act (EPCRA)

The Site has a Contingency Plan and General Emergency Response Procedures for Site Remediation Work (UC Davis, 1994), as required under 40 CFR Part 265. These have been distributed to the campus fire department, local medical centers and hospitals, and are required reading for all on-site workers, including employees of ITEH. To comply with EPCRA, UC Davis Environmental Health and Safety has also prepared the required emergency and hazardous chemical inventory for all hazardous substances present on University property that require Material Safety Data Sheets (MSDSs) including the Site. Compliance with reporting requirements of this regulation is summarized for the Site in Table 2-1.

Table 2-1. Compliance with Hazardous Material Reporting Under EPCRA

EPCRA 302-303: Planning Notification	[ ] Yes	[ ] No	[x] Not Required
EPCRA 304: EHS Release Notification	[ ] Yes	[ ] No	[x] Not Required
EPCRA 311-312: MSDS/Chemical Inv.	[x] Yes	[ ] No	[ ] Not Required
EPCRA 313: TRI Reporting	[ ] Yes	[ ] No	[x] Not Required

2.10 Toxic Substances Control Act: 40 CFR 763 (TSCA); and Demolition/Renovation Involving Asbestos: NESHAP Subpart M, 40 CFR 61.14

No asbestos removal was conducted in 1997.

2.11 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

Herbicides were used at the Site in 1997 by UC Davis Agricultural Services Department personnel to control weeds. Pesticides were applied following applicable campus and local regulations.

2.12 Endangered Species Act (ESA)

A number of sensitive biological resources with a potential for occurrence in the vicinity of the project Site along Putah Creek have been identified. These resources will be considered during future planning of remedial activities to minimize disturbance of these resources during remedial activities. The Ecological Scoping Assessment (ESA) (Weiss Associates, 1997j) identified special status species or those that have a high potential to exist in or near Putah Creek. The Assessment identified two plant species, five invertebrates, nineteen birds, two reptiles, one amphibian, and four mammals. These species and other potential receptors of concern are discussed in more detail in the Assessment. Habitat for the Valley Elderberry Longhorn Beetle has been identified at the Site.

Since the Site is in an area that contains critical wildlife habitat, activities undertaken during the LEHR environmental restoration will be coordinated with the U.S. Fish and Wildlife Service and the California Department of Fish and Game. A CEQA Preliminary Study for Site Characterization of the UC Davis Landfill was prepared for the University of California, Davis in February, 1990. This study identified the investigation techniques to be used during the characterization of the UC Davis Landfill at the Site, and discussed potential environmental impacts from those methods. The study concluded, "Although minor impacts were disclosed in the Environmental Checklist process, all impacts were temporary, consistent with existing land use and less than significant." The investigation techniques defined in the RI/FS Workplan (Dames and Moore, 1994) for soil characterization are similar to those described in the above-mentioned study, and therefore it is expected that associated environmental impacts will be temporary and not significant.

2.13 National Historic Preservation Act (NHPA)

All areas affected by current remediation activities involve existing building structures located on previously graded and developed land. An archeological evaluation was conducted during the Phase II Soil and Ground Water Characterization of the Site (DOE, 1992a). No evidence of cultural resources, historical or agriculturally sensitive areas was encountered.

2.14 Executive Order 11988, "Floodplain Management" and Executive Order 11990, "Protection of Wetlands"

The Site is not on a floodplain, nor is any portion of it designated as a wetland.

2.15 Other Major Environmental Issues and Actions

2.15.1 Engineering Evaluation/Cost Analysis (EE/CA) for the Southwest Trenches, Radium-226 /Strontium-90 (Ra/Sr) Treatment Systems, and Domestic Septic Systems Areas

Under CERLA an EE/CA was completed for the Southwest Trenches, Radium-226/Strontium-90 (Ra/Sr) Treatment Systems, and Domestic Septic Systems Areas to fulfill the requirements of Section 300.415 (b)(4)(I) of the National Contingency Plan. The EE/CA summarized the source, nature and extent of contamination in these areas; developed Removal Action Objectives for each area; and, evaluated several RA alternatives.

The Removal Action Objectives were:

- Lower the cumulative excess incremental cancer risk to an individual from exposure to site contaminants to within a nominal range of 10^{-4} to 10^{-6} using 10^{-6} as the point of departure;
- Reduce non-cancer hazard indices to levels below 1;
- Mitigate potential future impact to ground water;
- Mitigate potential ecological risks during and after the RA; and,
- Minimize impact to on-site University research.

The following RAs and accompanying risk levels were selected:

- ***For the Southwest Trenches Area the recommended RA alternative is Excavation, Off-Site Disposal, and Institutional Controls:*** This alternative intends to achieve RAOs through removal of waste, surface and subsurface soils impacted with carcinogenic constituents-of-concern (COCs) and achieve a cumulative excess cancer risk in the range of 10^{-4} to 10^{-5}. Non-carcinogenic COCs would be removed to levels that would result in a cumulative hazard index (HI) less than 1.
- ***For the Ra/Sr Treatment Systems Area, the recommended RA alternative is Excavation, Off-Site Disposal, and Institutional Controls:*** This alternative intends to achieve RAOs through removal of surface and subsurface soils impacted with carcinogenic COCs to achieve a cumulative excess cancer risk in the range of 10^{-4} to 10^{-5}. Non-carcinogenic COCs would be removed to levels that would result in a cumulative HI less than 1.

- ***For the Domestic Septic System Areas, the recommended alternative is Excavation, Off-Site Disposal and Institutional Controls:*** This alternative intends to achieve RAOs through removal of surface and subsurface soils impacted with carcinogenic COCs to achieve a cumulative excess cancer risk in the range of 10^{-4} to 10^{-6}. Non-carcinogenic COCs would be removed to levels that would result in a cumulative HI less than 1.

The RAs began in the spring of 1998, and are expected to be complete in approximately two years.

2.15.2 Decontamination and Decommissioning (D&D) Certification Docket

A certification docket was issued to document the successful D&D of Animal Hospital Nos. 1 and 2, the Specimen Storage Building, and the Co-60 Building (DOE, 1997b) (Figure 1-2). These buildings are now in compliance with applicable DOE and proposed EPA and Nuclear Regulatory Commission (NRC) standards and criteria for unrestricted use. The Specimen Storage Building and Co-60 Building are being used for University research.

2.15.3 Waste Volume Reduction and Cost Savings

This initiative, first employed in fiscal year 1993, continues to enable the Site to utilize off-site commercial supercompaction facilities to reduce waste by very significant amounts. Whenever possible, waste is reduced by shredding, crushing, and other size-reducing procedures. This results in cost reductions and also helps to conserve valuable landfill space.

2.15.4 Environmental Monitoring and Surveillance Plan

An Environmental Monitoring and Surveillance Plan (Weiss Associates, 1997h) was prepared in response to DOE Order 5400.1 "General Environmental Protection Requirements," Chapter IV, "Environmental Monitoring Requirements." This Plan identifies the scope of the fiscal year 1997 environmental monitoring and surveillance program with respect to the rationale and design criteria dictated by DOE Order 5400.1. The extent and frequency of sampling, procedures for laboratory analysis, quality assurance requirements, program implementation procedures, and guidelines for the preparation and distribution of reports are outlined in this Plan.

2.15.5 Risk Based Action Standards (RBASs)

Risk Based Action Standards (RBASs) were calculated as part of the ongoing CERCLA activities at the Site (Weiss Associates, 1997i). These action standards apply only to those areas for which DOE has responsibility, based on the MOA between DOE and UC Davis (DOE, 1997a).

The overall objective of this evaluation was to determine action standards for contaminated soil in the DOE areas, for both chemical and radiological COCs. Action standards for carcinogenic compounds were calculated for the incremental risk range of 10^{-4} to 10^{-6} established in the National Contingency Plan, 40 CFR part 300. Action standards for non-carcinogens were based on a hazard quotient of 1.0, consistent with EPA guidance. A detailed discussion of the methodology and results of the RBAS calculations is presented in the Draft Final Determination of Risk Based Action Standards for DOE Areas, Vol. I (Weiss Associates, 1997i).

A brief comparison of available chemical and radionuclide site soil concentrations to RBASs is presented below.

- ***At the 10^{-4} target incremental carcinogenic risk level:*** Three non-radionuclide carcinogenic chemicals in the Southwest Trenches exceed the calculated action standards. These chemicals are benzo(a)anthracene, benzo(a)pyrene and carbazole. Lead also exceeds the action standard. No carcinogenic chemicals in the other DOE areas exceed the RBASs. The radionuclide radium-226 in the Southwest Trenches exceeds the action standards at 10^{-4} target risk. For radium-226, the action standard is set at the site-specific background concentration, because the calculated action standard is less than background.
- ***At the 10^{-5} target incremental carcinogenic risk level:*** The action standards for six polynuclear aromatic compounds (PNAs), carbazole, lead and six radionuclides including radium-226 and strontium-90 are exceeded in the Southwest Trenches. In the Ra/Sr Treatment Systems Area, radium-226 and two PNAs exceed the calculated action standards. Radium-226 in the Western Dog Pens is above the action standard for 10^{-5} target risk. No radionuclides or carcinogenic chemicals in the Domestic Septic System Areas are above the calculated action standard. For radium-226, thorium-228, and thorium-232, the action standard has been set at the site-specific background concentration, because the calculated action standard is less than background.
- ***At the 10^{-6} target carcinogenic risk level:*** Additional carcinogenic chemicals and radionuclides exceed the action standards. In the Southwest Trenches, seven PNAs, six radionuclides including radium-226 and strontium-90, the pesticides chlordane and dieledrin, lead, polychlorinated biphenyl-1260 (PCB-1260), and two semivolatile organic compounds (SVOCs) were above the action standards. In the Ra/Sr Treatment Systems Area, six PNAs, radium-226 and benzene were above the action standards. Radium-226, chlordane and alpha BHC were above the action standards in the Western Dog Pens. No compounds were present above the action standard in the Domestic Septic System Areas. For radium-226, thorium-228, and throrium-232, the action standard is the site-specific background concentration, because the calculated action standard is less than background.
- ***Based on a hazard quotient of 1.0*:** The non-carcinogenic action standards for seven PNAs, five metals including cadmium and mercury, and one SVOC are exceeded in the Southwest Trenches. In the Ra/Sr Treatment Systems Area, copper exceeds the action standards. Mercury is above the action standard in the

Western Dog Pens. Barium is above the action standard in the Domestic Septic Systems Area.

Section 6 of the RBAS Report (Weiss Associates, 1997i) tabulates all of the action standard calculation results, the Area-specific reasonable maximum exposure (RME) soil concentration values, and the site-specific background values, and identifies by Area which COCs exceed the action standards at each target risk level.

2.15.6 Ecological Scoping Assessment

An ecological scoping assessment was performed in 1997 to support the Site risk assessment process (Weiss Associates, 1997j). The purpose of this scoping assessment was to:

- Identify chemical and radioisotope contaminants of potential ecological concern in media of potential ecological concern at the Site and vicinity;
- Characterize on-site and near-site ecological communities and habitats;
- Identify complete exposure pathways of potential environmental concern; and,
- Provide a preliminary assessment of the relative significance of each potentially complete exposure pathway with respect to receptor and contaminant groups.

This analysis addresses contaminants and potential exposure pathways specific to the DOE areas of responsibility as specified in the MOA, but is site-wide with respect to biological characterization.

Six environmental media groups were identified as being of potential ecological concern when contaminants are present. Five contaminant classes are present in DOE area soil above background. Contaminants present above background levels in DOE areas in surface and subsurface soil are the source for all complete ecological exposure pathways. In addition, storm water run-off was identified as the only potentially significant source of contaminants into the Putah Creek ecosystem. A summary of the ecological site characterization is shown in Table 2-2.

Table 2-2. Summary of Ecologically Significant Media and Associated Contaminant Classes

Environmental Media	Chemical/Radioisotope of Potential Ecological Concern				
	Volatile Organic Compounds	Semi-volatile Organic Compounds	Radionuclides	Pesticides	Metals
Surface Soil	✔	✔	✔	✔	✔
Subsurface Soil	✔	✔	✔	✔	✔
Ambient Air	✔		✔	✔	✔
Subsurface Air	✔		✔	✔	✔
Storm Water	✔	✔	✔	✔	✔
Surface Water	✔	✔	✔	✔	✔
Sediment			✔	✔	✔

The Agency for Toxic Substances and Disease Registry (ATSDR) concluded that, with the exception of lead and mercury, chemical and radionuclide contaminant levels in Putah Creek surface water, sediments, and fish do not pose a significant risk from the perspective of human exposure or ingestion (ATSDR, 1997). Because contaminants in DOE Area surface soil have the potential to migrate to Putah Creek via erosion and runoff during storm events, the storm water-surface water exposure pathways were evaluated using semi-quantitative methods. Results are shown in Table 2-3 and indicate that DOE areas are not a source of mercury to Putah Creek and that the DOE contribution of lead to Putah Creek is insignificant.

Table 2-3. Evaluation of Potential Lead and Mercury Contributions from DOE Areas to Putah Creek Ecosystem

Analyte	Maximum Concentration in DOE Area Surface Soil (ppm)	Background Concentration in DOE Area Surface Soil (ppm)	Maximum Concentration in DOE Storm Water (mg/l)	Maximum Concentration in Putah Creek downstream (mg/l)	COPEC in Surface Water?	DOE Mass Contribution
Lead	21	9.5	0.0384	0.01	Yes	0.7-0.9 %
Mercury	1	0.63	ND <0.0002	0.00027	No	Not Calculated

A biological field survey was conducted to compile an inventory of on-site and off-site sensitive plant and animal species (receptors) and to characterize on-site and off-site aquatic and terrestrial ecological habitats and communities. Data from other recent studies was also incorporated into this characterization, as were data from the California Natural Diversity Database. On-site and off-site biota were segregated into exposure groups and a generalized food web was constructed. From the food web analysis an exposure pathway assessment was conducted to identify potentially

complete ecological exposure pathways including the bioaccumulation pathway. A complete pathway is defined as consisting of a source, a transport mechanism, a receptor, and an uptake route. Preliminary evaluation of the biological characterization and exposure pathway analysis are summarized in Table 2-4 and indicate that biological receptors are present or have the potential to occur both on and off-site, at least one complete exposure pathway exists for each exposure group, and not all complete exposure pathways are significant.

Table 2-4. Numerical Summary of the Biological Characterization and Exposure Pathway Analysis

Location	Habitat Types	Special Status Plant Species	Special Status Plant Communities	Special Status Wildlife Species	Exposure Groups	Potentially Significant, Complete Exposure Pathways
On-site	3	0	0	14	11	6
Off-site	8	2	3	31	20	7

2.16 Summary of Permits

There were no permit violations involving Site operations in 1997. The following permits are related to operations at LEHR:

1. ***NPDES Permit #CA0077895 (EPA) and WDR Order No. 92-040 (California RWQCB, Central Valley Region):*** UC Davis permits for discharge of wastewater from the UC Davis Wastewater Treatment Plant to the south fork of Putah Creek.
2. ***EPA RCRA Permit #CAD982469702:*** Part A Permit application for storage of mixed waste (interim status).
3. ***Drilling permits***: Obtained as necessary from the Solano County Department of Environmental Health for the specific purpose of installing new borings or monitoring wells.

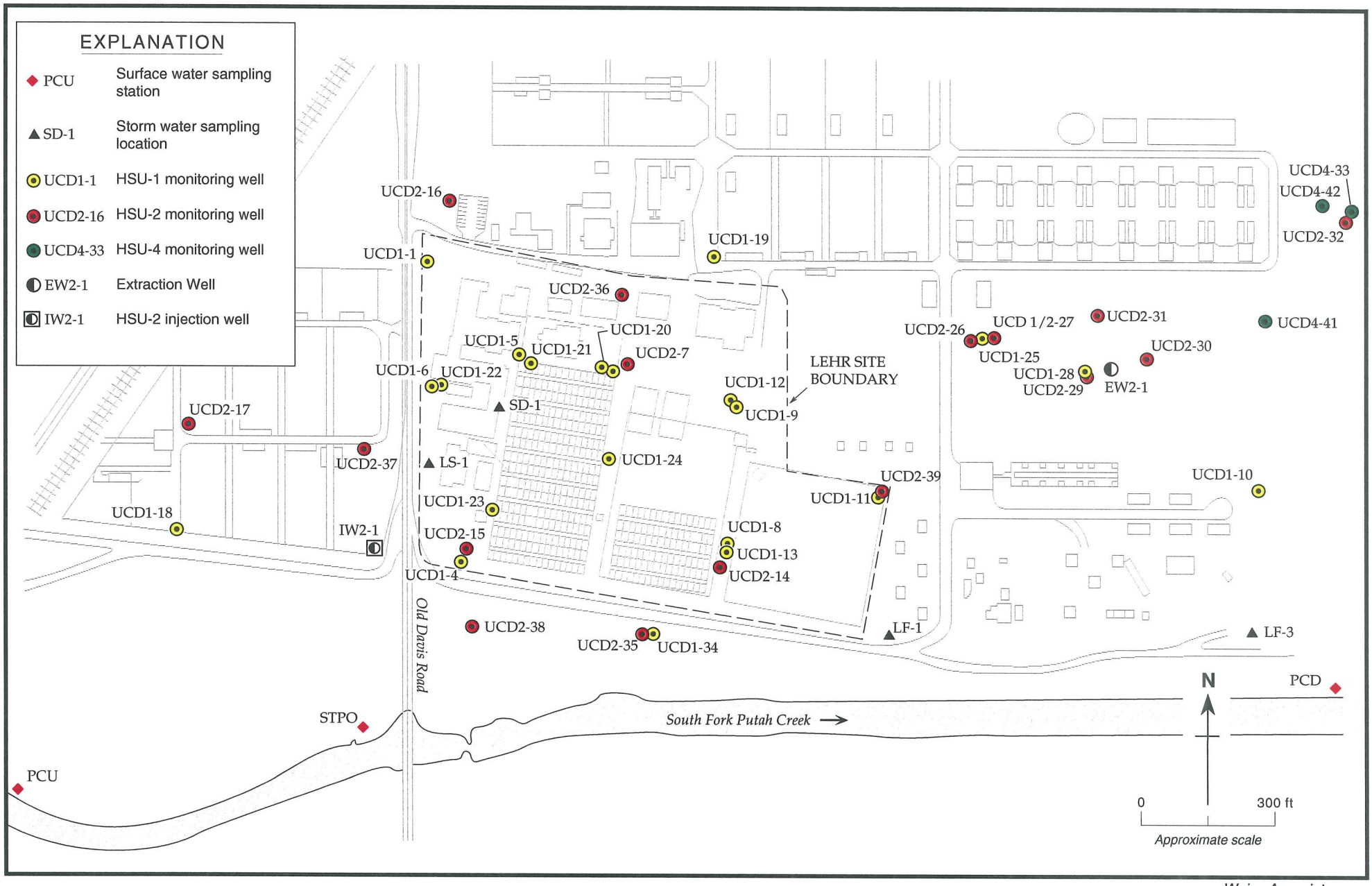

Figure 2-1. Monitoring Well, Storm Water and Surface Water Monitoring Locations, LEHR Site, Davis, California

Weiss Associates

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3. ENVIRONMENTAL PROGRAM INFORMATION

Each year DOE monitors the environment at the Site through air, water and soil sampling. This section describes the environmental monitoring program, and summarizes 1997 environmental site activities. The results of this monitoring program are discussed in Section 4.

3.1 Summary of Environmental Protection Program

The environmental protection program at LEHR consists of ongoing programs that include monitoring for compliance and any other relevant environmental protection requirements. Overall program requirements are defined in DOE Order 5400.1, as well as applicable federal, state, and local environmental regulations. This program consists of, but is not limited to, those actions needed for compliance in the following areas:

- Remedial actions involving cleanup of past actions under CERCLA;
- Ground water, surface water, soil, sediment, air, and biota monitoring defined by the Site investigation, the Water Monitoring Plan, and the Environmental Monitoring Plan;
- Documentation under NEPA;
- Reports to DOE, including this ASER and other reports required by DOE Orders;
- Hazardous waste management, including waste minimization, storage, segregation, characterization, designation, and disposal;
- Hazardous materials inventory and usage and other reports and information as requested or required by regulatory agencies; and,
- EPA permit requirements for storage of mixed waste if it is found during remediation.

3.2 Notification of Environmental Occurrences and Reporting

Requirements for notification and reporting of environmental occurrences are defined in DOE Orders and/or in the regulations governing release of hazardous materials. Environmental monitoring personnel have been instructed to notify appropriate management personnel if monitoring data indicate that hazardous material has been released above reportable quantities.

The Weiss Associates Project Manager is responsible for reporting environmental occurrences under DOE Orders 5484.1 and 232.1-1. These reports are submitted to DOE for review, analysis, and inclusion in annual summary reports. The reports are transmitted to the DOE System Safety and Development Center and DOE Headquarters. The Occurrence Reporting and Processing

System is utilized in this process. All reports are available for review by any organization, and can be obtained by contacting DOE, or the LEHR ER/WM Project Site office.

3.3 General Planning and Reporting

In addition to this ASER, general planning and reporting for the Site environmental management program is facilitated through documentation prepared by the DOE prime contractor, Weiss Associates. This ensures comprehensiveness of the environmental monitoring program at LEHR.

3.4 Environmental Monitoring Programs

The LEHR ER/WM Project performs environmental monitoring in accordance with permit and regulatory requirements to establish background information and to monitor operations related to Site restoration activities. The Weiss Associates Project Manager has responsibility for the oversight of these programs, and assures that plans are reviewed and updated as required by DOE orders.

3.4.1 Environmental Monitoring and Surveillance Plan

The environmental monitoring program for the LEHR ER/WM Project is described in the Environmental Monitoring and Surveillance Plans (DOE, 1992b and Weiss Associates, 1997h) developed in accordance with DOE Order 5400.1. These plans provide guidelines for the measurement and documentation of environmental releases, should they occur. Data are evaluated to determine the effects of DOE operations at LEHR on the environment, both on-site and off-site. The program supports environmental compliance requirements and promotes goals of the Site environmental management policy. Because remedial action at the Site is under CERCLA requirements, water, soil, and biota are being investigated within the streamlined CERCLA process.

3.5 Summary of Environmental Monitoring Performed

3.5.1 Effluent Monitoring

Storm water runoff and airborne emissions during D&D activities are the only effluent streams monitored by the Site Environmental Monitoring and Surveillance Program. Active liquid effluent discharges to the environment were curtailed in the 1980s at the end of the LEHR research activities. There are now no active radiological or hazardous liquid effluent discharges to the environment from DOE-sponsored activities at the Site. An analysis of potential airborne effluent sources (leach field, chemical dispensing areas, dog pen soils, Imhoff D&D, etc.), based on data collected prior to 1995, determined that current point and diffuse sources at the Site would result in an effective dose equivalent of below 0.06 mrem to any member of the public (DOE, 1995).

3.5.2 Ambient Radiation Monitoring

Passive thermoluminescent dosimeters (TLDs) are used to monitor gamma radiation at LEHR. Twenty-six TLDs are placed near perimeter fence lines, radioactive waste storage areas, and various work areas around the Site (Figure 4-8). The TLDs are collected quarterly, and an annual gamma radiation dose is calculated for each location. The laboratory data are normalized for each quarter by subtracting Site background activity from each location. The results of the ambient radiation monitoring program are discussed in Section 4.

3.5.3 Environmental Surveillance

3.5.3.1 Surface and Ground Water Monitoring

The Site Water Monitoring Plan (DOE, 1994a) has been developed to meet the requirements of DOE's General Environmental Protection Program as defined in DOE Order 5400.1 as well as applicable state and federal regulations. Water monitoring is conducted as part of the Site environmental restoration program.

Monitoring points have been identified to evaluate water quality and lateral and vertical extent of impact at the Site. The program is guided by data needs for risk analysis and evaluation of Site remediation alternatives. The scope of the program is modified when required to meet objectives (as approved by regulatory oversight agencies) as the CERCLA process and environmental restoration activities progress. This also provides flexibility necessary to obtain temporal and spatial information regarding chemical and radiological constituents.

In 1997 responsibility for the water monitoring program was transferred from DOE to UC Davis. UC Davis performed all ground water and surface water monitoring, and monitored storm water runoff from the UC Davis areas of the Site. DOE monitored storm water runoff from the DOE areas only.

3.5.3.2 Air Monitoring

A baseline air monitoring investigation was conducted under CERCLA. The one-year baseline air monitoring program began in August 1995, and included both radiologic and nonradiologic parameters for substances previously detected in Site soil, ground water, and surface water. The locations for air monitoring were based on historical records of Site activities, planned investigation activities, and soil and water monitoring data. Wind direction characteristics at the Site were also considered in determining the most appropriate air sampling station locations. In support of the air monitoring program, a meteorological station was constructed at the Site. Although the one-year baseline program was completed in August 1996, monitoring of selected radionuclides is ongoing, as discussed in Section 4.

3.6 Site Environmental Training

Site-specific environmental training has been conducted to instruct environmental restoration project personnel in methods of pollution prevention, waste minimization, and procedures to ensure environmental controls are adequately maintained during remediation activities. This training is conducted as part of the Site orientation training, and also prior to any new activity with the potential of impacting the environment. Daily safety meetings reinforce this training and specify steps needed to assure adequate environmental protection during that day's activities.

Before an employee is allowed to begin hazardous Site work, he or she must complete the 40-hour Occupational Safety and Health Administration (OSHA) "Hazardous Waste Operations Training." In addition, prior to working on Site, pollution prevention information is provided within the Site-specific "Hazard Communication Training." This training assures that the worker is aware of proper handling, usage, and disposal of chemicals used on the job. It also covers spill prevention and control as well as proper storage and chemical disposal methods. To prevent the spread of radioactivity to the environment, workers are trained in radiological control methods.

3.7 Waste Minimization

The Site Waste Minimization Plan (PNNL, 1995) reflects DOE's commitment to reduce the quantity and toxicity of waste generated at the Site during restoration activities. The plan is designed to satisfy the requirements of the Solid Waste Disposal Act, as amended by RCRA, Hazardous and Solid Waste Amendments of 1984, and the Pollution Prevention Act of 1990. It also complies with the intent of NEPA in developing waste management and minimization methodology to reduce the impact of these wastes on natural resources and the environment.

The plan requires that waste assessments be made for all project activities prior to initiation. Economically practicable waste reduction and minimization techniques, including waste abatement, recycling, good housekeeping, and treatment, are discussed. Methods to promote awareness and recognition of the waste minimization effort are also included. The plan is designed to eliminate or minimize pollutant releases to all environmental media. 1997 waste management activities are summarized in the Waste Management Annual Report (Weiss Associates, 1998i).

4. ENVIRONMENTAL RADIOLOGICAL PROGRAM INFORMATION

DOE activities at the Site in 1997 primarily focussed on gathering additional off-site and background data, further investigation of the Dog Pens area, and Site air and ambient radiation monitoring. Storm water monitoring was performed by both DOE and UC Davis for their respective areas; surface water and ground water monitoring and off-site neighbor well sampling were performed by UC Davis.

Data collection and Site monitoring programs are conducted under the guidance of the Site Environmental Monitoring and Surveillance Plan, and comply with CERCLA requirements.

4.1 Reporting Format for Radiological Results

Radiological results for 1997 air, soil and water samples are summarized in this report. The majority of radionuclide results in Site samples are close to or below the Minimum Detectable Activity (MDA) for the laboratory analysis methods. Many of the results are therefore reported either as negative numbers (measured sample activity below laboratory background) or with a high uncertainty associated with the result. It is helpful to understand the following information concerning the reporting format since this format is unique to radiological analyses.

Radionuclide results show the calculated activity of the sample and the counting error. The counting error represents the total statistical uncertainty resulting from measuring all random processes involved in the analytical procedures used. Individual errors associated with these processes are used to estimate the total uncertainty. The uncertainty value is reported as a two-sigma (two standard deviations) error for each sample analysis result. This uncertainty, therefore, approximates a 95% confidence interval about the reported value. The significance of the radionuclide results can be evaluated by comparing the reported value with the reported uncertainty. It should be noted that despite being statistically detectable on the basis of total uncertainty, a given sample result may not be significant in terms of health risk, presence of Site contamination, or regional background concentrations.

Uranium-238 and thorium-232 are naturally occurring radionuclides found in most soil, including soil at the Site. Uranium-238 decays into daughter products (progeny) such as thorium-234, radium-226, radon-222, bismuth-214, and lead-210. Thorium-232 progeny include radium-228, radon-220, lead-212, bismuth-212 and lead-208. Because these parent radionuclides are found in soil and ground water, their progeny are also expected to be found in soil and ground water analytical results. The ratio of parent to progeny can be used to estimate if a given radionuclide activity is due to decay of a parent product, or indicates a separate source of the daughter product. For example, radium-226 is present in soil as a natural daughter product of uranium-238. However, some radium-226 activities detected at the Site are higher than would be expected if the only source were decay of

uranium-238. These data and historical records can be used to evaluate release of radium-226 into Site soil.

4.2 Radiological Air Monitoring

4.2.1 Site Baseline Air Sampling

Atmospheric releases of pollutants from the Site to the surrounding region are a potential source of human exposure. For that reason, radioactive and nonradioactive materials in air have been monitored at a number of locations on and around the Site since August 1995. The influence of LEHR emissions on local pollutant concentrations is evaluated by comparing air concentrations measured at a distant location within the region to concentrations measured at the Site perimeter. This section discusses sample collection techniques and analytical methods of the LEHR air surveillance program.

Between August 1995 and August 1996, a one-year baseline air sampling investigation was completed. The analytical results of the one-year baseline air sampling investigation were presented in PNNL's Baseline Air Monitoring Report (Patton, 1996). Weiss Associates continued several elements of the monitoring program through 1997 to provide additional baseline radiological data. The 1997 air monitoring program is summarized here, and will be discussed in more detail in the LEHR Comprehensive Air Monitoring Baseline Report (Weiss Associates, in progress).

Based upon the results of the one-year baseline air sampling investigation and the requirements to conduct environmental surveillance under DOE Orders 5400.1 and 5400.5 and DOE/EH-0173T – Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance (DOE, 1991), Weiss Associates implemented a reduced air monitoring program in January 1997, which includes:

1) Continuous monitoring at three on-site stations, AM-2, AM-3, and AM-5 (Figure 4-1) and the background station AM-6 (Figure 4-2) for alpha and beta activities;
2) Quarterly radon sampling of the three on-site stations and the background station; and,
3) Continued collection of meteorological data at the on-site meteorological station.

The reduced air monitoring program eliminated continuous sampling for tritium (H-3) and quarterly monitoring for non-radiological compounds (chlordane, respirable particulate matter [PM-10], metals, VOCs). See Figures 4-1 and 4-2 for sample locations. The goals of the program are to:

- Document background air concentrations for contaminants of concern;
- Support a quantitative risk assessment;

- Detect, characterize and report unplanned releases;
- Identify potential environmental problems and evaluate the need for remedial actions;
- Allow assessment of airborne impacts during remedial actions;
- Evaluate local meteorological conditions at the Site; and,
- Verify compliance with applicable federal, state, and local regulations and DOE Orders.

The approach for radionuclide monitoring in air includes continuous air monitoring for particle-associated radionuclides and for radon. Radionuclides to be analyzed in air samples were selected on the basis of: (1) their detection in Site soil or ground water in typical above-background activities; (2) past Site history and use; and (3) their relative importance in terms of potential dose to man and the environment. Radionuclides from several categories were selected for measurement:

- Gamma-emitting radionuclides (cobalt-60, cesium-137 and radium-226);
- Uranium-238 and thorium-232 decay chain radionuclides (includes radium-226 and radon-222);
- Beta-emitting radionuclides (strontium-90);
- Radon-222 to assess possible impacts from the decay of radium-226 wastes; and,
- Gross alpha and gross beta.

Perimeter air samplers are located around the Site, with emphasis on the prevailing downwind directions to the north and south of the Site. The distant location is located at the Long Term Research Acquisition Site (LTRAS), located approximately 7 mi northwest of the Site and provides background data from an area essentially unaffected by Site operations.

Radon is sampled at four locations using passive alpha-track air sampling cartridges. The air sampling cartridges are identical to those used for sampling residential radon activities. The cartridges are exchanged quarterly.

4.2.2 Radiological Results for Baseline Air Monitoring Program

The analytical results of the 1997 reduced air monitoring program are summarized below and will be discussed in more detail in the LEHR Comprehensive Air Monitoring Baseline Report (Weiss Associates, in progress).

Both the average and maximum activities of total alpha radiation collected during 1997 were similar for Site perimeter locations and the distant location, indicating that the observed levels were predominantly the result of natural sources and worldwide fallout. The highest 1997 average air activity for a Site location was at AM-5 (2.3×10^{-3} pCi/m^3) which was not statistically different from the average activity at the distant location (2.6×10^{-3} pCi/m^3). Elevated total alpha activities were

observed both on-site and off-site between September and December of 1997. The highest 1997 gross alpha air activity for a Site location was at AM-3 (7.7×10^{-3} pCi/m^3), which was similar to the highest 1997 gross alpha air activity at the distant location (5.0×10^{-3} pCi/m^3).

Total beta radiation activities in ambient air collected during 1997 were similar for Site perimeter locations and the distant location. The highest average total beta activity at a Site perimeter location (AM-3, 1.5×10^{-2} pCi/m^3) was the same as that of the distant location (1.5×10^{-2} pCi/m^3), indicating that the observed levels were predominantly a result of natural sources and worldwide fallout. No statistical differences were observed between the average total beta activities measured at the Site perimeter locations compared to the distant location. Similar to total alpha activities, elevated total beta activities were observed both on-site and off-site in October and December of 1997. The highest 1997 gross beta air activity for a Site location was at AM-5 (3.3×10^{-2} pCi/m^3), which was similar to the highest 1997 gross beta air activity at the distant location (2.9×10^{-2} pCi/m^3).

Three biennial composite air samples collected during 1997 were analyzed for gamma-emitting radionuclides. Samples were collected from November 1996 to March 1997; March 1997 to August 1997; and September 1997 to February 1998. The results of the most recent composite air sample were not received in time to be analyzed for this report, but will be included in the LEHR Comprehensive Air Monitoring Baseline Report (Weiss Associates, in progress).

Fifteen radionuclides were detected in at least one onsite composite sample. All gamma-emitting radionuclides were well below the DOE Derived Concentration Guides (DCGs) specified in DOE Order 5400.5, "Radiation Protection of the Public and the Environment." The DCG values represent the activity of a radionuclide in air that an individual could continuously inhale at average annual rates without receiving an effective dose equivalent of greater than 100 mrem/yr.

Four quarterly composites were collected at three on-site and one remote air monitoring station. The average radon activity detected on-site during 1997 was 0.4 pCi per liter (pCi/l), with a maximum activity of 0.6 pCi/l. The average detectable off-site radon activity was 0.6 pCi/l, with a maximum activity of 0.9 pCi/l. All measured radon air activities and detection limits were below the DOE DCG of 3.0 pCi/l, although the highest on-site and off-site activities exceeded the NESHAP limit of 0.3 pCi/l. Since radon activity is higher off-site, radon in the vicinity of the Site is probably associated with background sources.

4.3 Radiological Measurements for Soil

The following section summarizes 1997 field activities and important soil analytical results for radiological compounds for the DOE areas at the Site. Results for non-radiological compounds are discussed in Section 5.

Soil sampling in support of the on-going CERCLA remediation was performed in several areas in 1997. The soil sampling methods consisted of soil borings and grab samples. In soil boring, a hollow stem auger is drilled to various depths, producing cylindrical soil cores from which appropriate samples are removed and prepared for analysis. Grab samples are obtained by shovel or trowel from the soil surface or from soil unearthed during activities such as trenching, and then

prepared for analysis. Soil samples are shipped to a contract laboratory to undergo the requested suite of analysis. Full descriptions of the soil sampling methods, procedures for sample preparation and shipment, requested analyses and minimum detectable activity limits, along with the associated quality assurance/control requirements, are contained in the relevant workplans.

Soil sampling was conducted in the vicinity of five of the seven domestic septic tanks. Samples were collected from borings at depths between 5 and 13 feet bgs. The results of this investigation are presented in the Technical Memorandum Results of Data Gaps Investigation – Domestic Septic Tank Systems (Weiss Associates, 1998a). In addition, gamma radiation surveys were conducted throughout the western dog pens area, and soil and gravel samples were collected from selected dog pens. These data were collected to determine whether "hot spots" were present in the surface soil, and if so, whether there was any identifiable pattern or correlation which would help to predict the location of such "hot spots". The results of this investigation are discussed here and presented in detail in the *Final Phase C Addendum to Final Work Plan for Western Dog Pens, Background, and Off-Site Investigations* (Weiss Associates, 1998b), and the *Technical Report, Results of Western Dog Pens, Background, and Off-site Investigations* (Weiss Associates, 1998g). In addition, surface soil samples were collected from eight off-site locations along Old Davis Road, and from six off-site background soil borings. These samples were collected to determine if elevated contaminant concentrations were present in off-site soil, and to provide additional on-site background soil data. These investigations are summarized briefly in this report, and are discussed in more detail in the Technical Report (Weiss Associates, 1998g).

Soil results discussed in this report are commonly compared to background levels as a means of identifying elevated concentrations. A more detailed discussion comparing soil results to the RBAS will be included in the final reports for the respective investigations.

4.3.1 Domestic Septic Tank Systems

The Domestic Septic Tank Systems were investigated in the 1997 Data Gaps Investigation (DGI). DGI field work was conducted the week of June 8, 1997 in accordance with the Final Work Plan for the Data Gaps Investigation (IT, 1997c).

The primary objective of the DGI was to collect the necessary information to determine if any of the five domestic septic systems and/or the northern extent of the Radium-226 seepage trench (Figure 1-2) pose an unacceptable risk to human health or the environment. The soil sample locations were selected to target areas of potentially high contaminant concentration. The concentration distribution was estimated based on the current conceptual model of each work area, and on field screening measurements and analyses associated with the Limited Field Investigation conducted in 1996.

A comprehensive and detailed description of the septic tank systems and radium seepage system are presented in the Final Work Plan for Data Gaps Investigation (IT, 1997c), Limited Field Investigation (LFI) Work Plan (IT, 1996), Site Characterization Summary Report (Weiss Associates, 1997a), and the RI/FS Work Plan (Dames and Moore, 1994b).

Tables 4-1 summarizes the results of the 1997 DGI and previous domestic septic system investigations and discusses radionuclides detected at levels above background and/or above the RBAS. These data show that releases have occurred and additional data may be required to support No Further Action as the selected RA.

Table 4-1. Significant Findings for the Seven Domestic Septic Systems

Domestic Septic Tank Number	Significant 1997 DGI Findings
1	• Investigation of trench T1A, located south of Septic Tank No. 1, detected radium-226 above the RBAS. Bismuth-214, thallium-208, uranium-235, and gross alpha were detected at activities that are less than two times the background levels (Figure 4-3), but below the RBAS. Tritium was detected below the RBAS at 340 pCi/l in the sample at 5-ft depth.
2	• Not sampled during 1997 DGI. Samples collected adjacent to the Ra-226 Treatment System distribution box during the Limited Field Investigation addressed this septic system. This tank will likely be removed during the Ra-226 Treatment System RA.
3	• Radium-226 and cesium-137 were detected above the RBAS. Uranium-235 , thallium-208, bismuth-214 were detected in some soil samples at activities that are less than two times the background levels (Figure 4-4), but below the RBAS.
4	• Uranium-235 was detected above the RBAS. Tritium was detected below the RBAS at 1270 pCi/l in the sample at 8-ft depth; the background level is 105 pCi/l (Figure 4-4).
5	• Although hand auger borings were advanced in the vicinity of Tank No. 5, no samples were collected for chemical analysis. The tank was not found. However, it is believed that a building has been constructed atop Tank 5 and that the effluent drained to the Septic System No. 1 leach-field. Facility drawings indicate the effluent line from Tank 5 was installed with a trend in the approximate direction of Domestic Septic System No. 1 leach-field and a pipe was field-located that drained into the leach-field from the purported direction of Tank No. 5.
6	• Uranium-235 was detected above the RBAS. Bismuth-214 and thallium-208 were detected in some soil samples at activities that are less than two times the background levels (Figure 4-5), and below the RBAS. Tritium was detected below the RBAS at 460 pCi/l in the sample at 8-ft depth; the background level is 105 pCi/l.
7	• Not sampled during 1997 DGI. • During the 1996 Limited Field Investigation, three soil samples were collected adjacent to the tank. Radium-226 was detected slightly above the RBAS.

4.3.2 Dog Pens Investigation

As described in the Final Work Plan for the *Western Dog Pens, Background, and Off-Site Investigations* (Weiss Associates, 1997g), Dog Pens Investigation Phase A results were used to select sampling locations for the Phase B Investigation. Phase A consisted of: 1) reviewing all previously

collected Dog Pens chemical/radiological data; 2) reviewing available reports for information on Dog Pens operations; 3) interviewing former Dog Pens staff; and, 4) conducting a reconnaissance gamma radiation survey over the entire surface of the Western Dog Pens area. Based on Phase A results, sampling strata were defined based on indications (both laboratory results and field readings) of chlordane and radium-226 levels in each dog pen, and 12 dog pens were randomly selected to represent these strata.

During Phase B: 1) a detailed gamma survey was conducted on the gravel surface of the 12 selected dog pens; 2) 3 to 5 gravel samples were collected from each pen based on the survey results; 3) the gravel was removed and a detailed gamma survey was conducted on the exposed soil surface; and, 4) 4 to 7 surface soil samples were collected from each pen. A total of 46 gravel and 75 soil samples, including 4 gravel and 6 soil duplicates, were submitted to General Engineering Laboratories (GEL) in Charleston, South Carolina for selected radionuclide, organochlorine pesticide, mercury, hexavalent chromium, and nitrate analyses. The radionuclide analytic results are discussed below, and non-radionuclide analytic results are discussed in Section 5.

Phase B data for radionuclides indicate that:

- Radionuclide levels were representative of background (as defined in Weiss Associates, 1997a), with the exception of:

Constituent	Medium	Soil Background	Number of Samples Above Background[1]	Detections >2x Background Maximum Detected (pen ID for maximum)
Radium-226	Gravel	0.75 pCi/g	12 out of 46[2]	1 of 46 – 1.94 pCi/g (C-32)
Radium-226	Soil	0.75 pCi/g	9 out of 75	1 of 75 – 1.88 pCi/g (H-32)
Strontium-90	Gravel	0.056 pCi/g	4 out of 46[2]	4 of 46 – maximum of 3.59 pCi/g (C-32)
Cesium-137	Soil	0.012 pCi/g	39 out of 75	36 of 75 – maximum of 0.115 pCi/g (D-25); 0.113 pCi/g (G-32)
Thorium-234	Soil	0.78 pCi/g	18 out of 75	2 of 75 – 1.6 pCi/g (H-32); 1.62 pCi/g (D-20)
Uranium-238	Gravel	0.65 pCi/g	6 out of 46[2]	None
Uranium-238	Soil	0.65 pCi/g	23 out of 75	7 of 75 – maximum of 1.62 pCi/g (D-20)

[1]Background as calculated in Weiss Associates, 1998h
[2]Background level is for local soil and may not be appropriate for comparison with this gravel, which is imported

Identified "hot spots" were of very limited lateral extent.

- There is no discernable intra-pen or inter-pen pattern to the elevated activities distribution.
- No correlation is evident between surface gravel activities and radionuclide activities reported in soil directly underlying the surface gravel activities.
- There is no correlation between field recorded gamma activities and laboratory reported radium-226 activities.

The Phase B results indicate that areas of radium-226 (defined here as activities greater than two times background, or about 1.5 pCi/g are few and of very limited lateral extent. Samples adjacent to the identified elevated activities were located as close as 1.2 ft away. In all cases, samples adjacent to elevated activities had radium-226 levels below background. Therefore, based

on the Phase B results, radionuclide "hot spots" of 1.2-ft radius or *smaller* may be present in the Western Dog Pens.

Phase A and B results were used to design Phase C of the Western Dog Pens investigations. This investigation was conducted in February, 1998, and focussed on further definition of the vertical extent of radionuclides and other COCs.

4.3.3 Background Soil Investigation

Defining defensible background levels is key to establishing cleanup goals for the Site. The primary goal of the Background Soil Investigation (BI) was to provide supplemental data to provide statistically defensible background levels. The BI work consisted of:

- Conducting an underground utility clearance;
- Exploration drilling and sampling at appropriate locations and depths;
- Analyzing the samples for selected radionuclides, VOCs, SVOCs and pesticides; and,
- Statistically analyzing both these new data and the previously-collected background data to establish background levels.

Six soil borings were drilled at the locations shown in Figure 4-6, and 52 samples were collected for analyses.

4.3.3.1 Statistical Analysis

A statistical analysis of existing and new background data was performed to identify any statistically significant differences between the 1997 data and previously gathered background data, and for depth/soil type variations. For those analytes with no significant differences between data sets, the previously established background levels (Weiss Associates, 1997a) were refined by combining the two data sets and recalculating the background level. Where significant differences between the old and new data sets were identified, the new data was used to calculate a new background level.

Table 4-2 presents the newly established radionuclide background values established through statistical analysis and review of BI data.

Table 4-2. 1997 Revised Background Values for Radionuclides

Radionuclide	Former[a] Background Values (pCi/g)	n	Standard Deviation (pCi/g)	Consolidated Data Background Value (pCi/g)	n	Standard Deviation (pCi/g)	Stratified **Clay** Background Value (pCi/g)	n	Standard Deviation (pCi/g)	Stratified **Sand** Background Value (pCi/g)	n	Standard Deviation (pCi/g)
Actinium-228	0.71	24	0.10	0.64	48	0.0698	0.63	31	0.050	0.66	17	0.084
Americium-241	None	N/A	N/A	ND < 0.014	N/A	N/A	ND < 0.014	N/A	N/A	ND < 0.014	N/A	N/A
Bismuth-212	none	N/A	N/A	0.43	48	0.0479	0.43	31	0.037	0.41	17	0.055
Bismuth-214	0.57	24	0.10	0.54	69	0.0676	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Carbon-14	0.87	24	1.9	ND < 0.13	N/A	N/A	ND < 0.13	N/A	N/A	ND < 0.13	N/A	N/A
Cesium-137	0.053	26	0.046	0.012	48	0.0436	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Cobalt-60	0.016	26	0.015	ND < 0.006	N/A	N/A	ND < 0.006	N/A	N/A	ND < 0.006	N/A	N/A
Gross Alpha	11.8	25	3.3	8.7	48	1.69	9.0	31	1.7	7.4	17	1.4
Gross Beta	17.4	26	2.5	15	47	1.73	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Lead-210	none	N/A	N/A	1.6	48	0.578	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Lead-212	0.74	24	0.13	0.70	69	0.0932	0.73	40	0.075	0.69	29	0.066
Lead-214	0.75	24	0.15	0.58	47	0.0492	0.58	31	0.045	0.56	16	0.052
Potassium-40	13.6	24	1.6	14	70	1.21	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Plutonium-241	none	N/A	N/A	ND < 0.50	N/A	N/A	ND < 0.50	N/A	N/A	ND < 0.50	N/A	N/A
Radium-226	0.77	26	0.23	0.75	71	0.143	0.75	42	0.13	0.70	29	0.15
Radium-228	none	N/A	N/A	0.64	47	0.0705	0.63	30	0.051	0.66	17	0.084
Strontium-90	0.36	26	0.33	0.056	47	0.0207	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Thallium-208	0.21	24	0.036	0.22	68	0.0271	0.22	39	0.022	0.21	29	0.030
Thorium-228	0.71	26	0.12	0.74	24	0.119	0.76	11	0.093	0.63	13	0.098
Thorium-230	0.80	22	0.071	0.79	20	0.0605	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A

Table 4-2. 1997 Revised Background Values for Radionuclides (continued)

Radionuclide	Former[a] Background Values (pCi/g)	n	Standard Deviation (pCi/g)	Consolidated Data Background Value (pCi/g)	n	Standard Deviation (pCi/g)	Stratified **Clay** Background Value (pCi/g)	n	Standard Deviation (pCi/g)	Stratified **Sand** Background Value (pCi/g)	n	Standard Deviation (pCi/g)
Thorium-232	0.64	24	0.083	0.75	24	0.129	0.80	11	0.13	0.60	13	0.075
Thorium-234	1.1	24	0.23	0.78	48	0.130	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Tritium	none	26	69	ND < 1.2	N/A	N/A	ND < 1.2	N/A	N/A	ND < 1.2	N/A	N/A
Uranium-233/234	0.66	26	0.093	0.68	24	0.0905	0.71	11	0.080	0.59	13	0.067
Uranium-235	0.071	24	0.015	0.039	47	0.0082	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Uranium-238	0.63	26	0.087	0.65	19	0.090	0.65	11	0.063	0.56	8	0.084

Notes:

Background values are the 80% lower confidence limit on the 95th percentile for the sample data set.

n = Number of sample concentrations used to calculate background cutoff value.

N/A = Not Applicable

none = not previously calculated.

Not Stratified = Statistical tests indicated sample means for clay and sand soil type data were not significantly different.

ND < ## = All results below the indicated detection limit.

a = Background values determined for use in the Risk Based Action Standards Report (Weiss Associates 1997). RBAS background values are the 90% lower confidence limit on the 95th percentile. The RBAS background values were previously reported incorrectly as the 80% lower confidence limit on the 95th percentile.

4.3.4 Off-Site Radium-226 Investigation

The main objective of the Off-Site Radium-226 Investigation (ORI) was to more fully define the lateral and vertical extent of potential environmental impacts from past overflow of the Radium-226 leach system and other surface runoff in this area (Figures 1-2 and 4-7).

The major elements of the ORI included:

- Conducting a surface gamma radiation survey;
- Collecting soil samples for analysis; and,
- Analyzing the samples for selected radionuclides.

Soil samples were collected from depths of up to 1.5 feet in eight locations, and analyzed for radionuclides, pesticides and metals. The sampling locations were selected based on the results of the surface gamma radiation survey and proximity to the Radium-226 treatment system dry wells.

Soil sampling locations and detected compounds are shown in Figure 4-7. Radium-226 was detected at a maximum of 1.28 pCi/g, above the background level of 0.75 pCi/g, at two locations on the east side of the road. Other radionuclides detected slightly above background in one or more samples include Bi-212, Bi-214, Cs-137, and Pb-214. Of these, the only radionuclides exceeding two times background were Bi-214 at 1.66 pCi/g in one sample, Cs-137 at up to 0.32 pCi/g in five samples, and Pb-214 at 1.82 pCi/g in one sample. There was no clear correlation between the field gamma readings and the laboratory results for gamma emitters.

Because Cs-137 was detected above two times background and above the 10^{-6} residential preliminary remediation goal (PRG) in all five ORI samples for which it was analyzed, all 15 ORI samples were re-analyzed for Cs-137. Preliminary results have been received, but have not yet been validated. These preliminary "confirmation" Cs-137 analytic results indicate that: 1) the results discussed above are valid; 2) the activities measured in the other four surface samples are also above two times background and the 10^{-6} residential PRG; 3) the activities measured in the three samples from 0.5 ft are lower than in the overlying surface sample, but still exceed two times background and the 10^{-6} residential PRG; and, 4) the activities in the three samples from 1.5 ft bgs are all below two times background and the 10^{-6} residential PRG.

4.4 Water Monitoring for Radiological Constituents

Quarterly ground water and surface water sampling has been conducted since 1990 for an extensive list of analytes. In 1997, in accordance with the MOA, responsibility for surface water and ground water sampling was transferred to UC Davis. DOE retained responsibility for storm water runoff sampling in the DOE areas of the Site. The results of the surface water and storm water sampling are summarized here, and discussed in detail in the *Quarterly Water Sampling Reports* (Dames and Moore, 1997b, 1998a, 1998b) and the *Annual Water Monitoring Report* (Dames and Moore, in progress). The ground water monitoring results are discussed in Section 6 of this report.

4.4.1 Surface Water Monitoring

In 1997 surface water samples were collected quarterly from three locations, Putah Creek Upstream (PCU), Putah Creek Downstream (PCD) and Wastewater (Sewage) Treatment Plant Outfall (STPO) (Figure 2-1). No radionuclides were detected above the MDA.

4.4.2 Storm Water Monitoring

Storm water samples are collected twice a year; once at the beginning of the rainy season after the first storm of the season, and once near the end of the season. The fall 1996 storm water samples were collected in December 1996, and the results were not received in time to include in the 1996 ASER. These samples and the spring and fall 1997 samples are discussed in this report. In accordance with the MOA between DOE and UC Davis (DOE, 1997a), DOE collected storm water from the lift station located on the western border of the site (LS-1 in Figure 2-1) and UC Davis collected samples from the UC Davis areas of the site (LF-1 and LF-3).

Storm water samples were collected in December 1996, May 1997 and November 1997. Americium-241, carbon-14, radium-226, gross alpha and gross beta were detected above their MDAs. None of these compounds exceeded their Maximum Contaminant Level (MCL).

4.5 NESHAP Dose Estimation Calculations

Calculations were performed to determine the potential or estimated dose from Site sources to the public. These calculations were based on Site residual surface soil contamination (diffuse sources). No significant remediation activities resulting in elevated fugitive emissions were undertaken during 1997. The only potential sources of emissions on the Site during 1997 were re-entrainment and subsequent dispersion of surface soil dust containing potentially elevated concentrations of radionuclides. Estimated contributions to the annual Site EDE from nonpoint source emissions (surface soil) are shown in Table 4-3, and are well below the NESHAP limit.

Table 4-3. 1997 Estimated Annual Maximum Effective Dose Equivalent

Maximum Individual Dose[1]	EPA and DOE Standard
1.8×10^{-3} mrem/year (1.8×10^{-5} mSv/year)	10 mrem/year (0.1 mSv/year)

Notes:
[1] = Maximum effective dose equivalent from 1997 Radionuclide Air Emission Annual Report. Data are calculated, not measured; therefore, they represent potential or estimated rather than actual doses.
[1 Sievert (Sv) = 100 Roentgen equivalent man (rem)]

The Site nonpoint or diffuse sources (areas with known or potential radionuclide contamination resulting from past DOE activities at the Site), include the strontium-90 leach field, the radium-226 seepage system, the southwest trenches area, the north chemical dispensing area,

eastern and western dog pen areas, inactive landfill units and the storm water runoff system. Of these nonpoint sources, four have been determined to have radioactive material in near-surface soil (0 to 3 ft below ground surface) that could potentially lead to airborne radioactive material emissions. Those sources are the radium-226 seepage system, the strontium-90 leach field, the southwest trenches area, and the eastern and western dog pen areas. Emission estimates from these sources are discussed below.

4.5.1 Nonpoint/Diffuse Source Emission

As noted above, there are no remaining point sources of radionuclide emissions at the LEHR facility. Compliance with the NESHAP requirements for diffuse, non-point source emissions was assessed using the EPA approved DOE atmospheric dispersion/radiation dose calculation computer code, CAP88-PC version 1.0. Conservative radionuclide emission rates were estimated using maximum soil activities measured above background for each of four potential fugitive area sources, and applying the U.S. EPA recommended particulate resuspension rate model to calculate the fugitive dust emission rates (Cowherd, 1985).

These dust emissions rates were used to calculate the total estimated contribution to the EDE. The total contribution was estimated to be 1.8×10^{-3} mrem/year (Table 4-4). The CAP88-PC computer code was then used to calculate the EDE to individual receptors at various distances and from each of the four potential LEHR facility radionuclide emission sources. The estimated EDE to a Maximally Exposed Individual (MEI) at the LEHR facility was determined by summing the contributions from all four potential LEHR facility radionuclide emission sources. Based upon the combined source exposures, the MEI assumed for the LEHR facility would be located on-site in the Medical Clinic Building. The results of the assessment are shown in Table 4-4.

Table 4-4. Estimated Dose Equivalent to On-Site Maximally Exposed Individual from Site Nonpoint/Diffuse Sources

Nonpoint Source	Dose Equivalent[1]	Percent of NESHAP
Ra/Sr leach system	6.3×10^{-5} mrem/yr	<0.001
Southwest trenches area	6.6×10^{-4} mrem/yr	<0.007
Western dog pen area	1.1×10^{-3} mrem/yr	<0.01
Eastern dog pen area	8.3×10^{-6} mrem/yr	<0.0001
Total Combined Contribution	1.8×10^{-3} mrem/yr	<0.02

Notes:
[1] = Maximum EDE from 1997 NESHAP report. Data are calculated, not measured. Therefore, they represent potential or estimated rather than actual doses.
[1 Sievert (Sv) = 100 rem]

This calculated exposure for the MEI is very conservative due to the close proximity of the western dog pens area, and the assumption that maximum activities of all radionuclides are distributed across the entire western dog pens area. Despite the conservative assumptions, however, the resulting EDE from all sources to the MEI is 1.8 x 10-3 mrem/yr, significantly below the 10 mrem/yr NESHAP standard.

The CAP88-PC computer code was also used to calculate the collective population dose, as required by DOE 5400.5. The collective population dose is calculated as the average radiation dose to an individual in a specified area, multiplied by the number of individuals in that area. The calculation included receptors at a distance of up to 10 km, rather than 80 km as specified in DOE Guidance, to avoid including the large number of receptors in the Sacramento area whose exposure to radionuclides resulting from the LEHR facility are negligible, but whose population numbers would have a large effect on population run results. This approach is appropriate for calculating the collective population dose for the primarily rural LEHR facility surroundings. The maximum off-site receptor exposure is estimated to be 5.6 x 10-5 mrem/yr; significantly below the 10 mrem/yr NESHAP standard (Table 4-5).

Table 4-5. Summary of Estimated Off-site Collective Population Dose Resulting from Radionuclide Emissions from Each Fugitive Dust Emission Source

Location	Off-Site Maximally Exposed Individual (mrem/yr)[1]	Distance[2]	Collective Population Dose (person-rem/yr)
Ra/Sr leach systems area	4.5×10^{-6}	250 m North	1.5×10^{-5}
Southwest trenches area	1.2×10^{-5}	250 m North	4.0×10^{-5}
Western dog pens area	3.7×10^{-5}	250 m North	1.2×10^{-4}
Eastern dog pens area	3.3×10^{-6}	250 m North	1.1×10^{-5}
Total Site	**5.6×10^{-5}**		**1.8×10^{-4}**

Notes:
[1] = Maximum off-site EDE from 1997 Draft Final NESHAP report. Data are calculated, not measured. Therefore, they represent potential or estimated rather than actual doses.
[2] = Distance and direction from source area centered from source area center to MEI receptor location.
[1 Sievert (Sv) = 100 rem]

4.6 Passive Thermoluminescent Dosimeter (TLD) Monitoring Program

The LEHR ambient radiation monitoring program uses TLDs to monitor gamma radiation throughout the Site. The TLDs are placed near perimeter fence lines, radioactive waste storage areas, and various work areas around the Site (Figure 4-8). The TLDs are collected quarterly, and an annual gamma radiation dose is calculated for each location. In 1997, TLD detectors and analyses were provided by two laboratories; the first and second quarters of data were provided by ICN Dosimetry Services, and the third and fourth quarters were provided by Radiation Detection Company. Both laboratories are certified by the National Voluntary Laboratory Accreditation Program. The laboratory data are normalized for each quarter by subtracting Site background activity from each location. TLD 35, located at the equine center several hundred feet to the north of the Site is used to monitor background.

The annual background dose near the LEHR Site is 72.2 milliroentgen (mR)/yr which is consistent with previous years. The annual dose at the Site exceeded the offsite background by 0.5 to 1.0 mR in 3 of 24 locations, but only for one quarter in each of those three locations. The DOE public dose limit for exposure of members of the public as a consequence of routine DOE activities is

100 mR/yr. These results show that ambient radiation detected at the Site is not elevated with respect to offsite background, and is well below the DOE dose limit for the general public.

Table 4-6. 1997 Ambient Radiation Monitoring Results - Dose Above Background

Badge Location Name	Map Location Number	1st Qtr Jan-Mar mR/qtr	2nd Qtr Apr-June mR/qtr	3rd Qtr July-Sept mR/qtr	4th Qtr Oct-Dec mR/qtr	Annual Total mR/yr
Equine (Background)	TLD-35	16.5	12.7	20.0	23.0	72.2
NW corn	TLD-1	0.5	0.0	0.0	0.0	0.5
NE corn	TLD-2	0.0	0.0	0.0	0.0	-
BTR-3	TLD-3	0.0	0.0	0.0	0.0	-
NCC	TLD-4	0.0	0.0	0.0	0.0	-
MWS	TLD-6	0.0	0.0	0.0	0.0	-
N Co-60	TLD-7	0.0	0.0	0.0	0.0	-
E Co-60	TLD-8	0.0	0.0	0.0	0.0	-
E Co-60	TLD-9	0.0	0.0	0.0	0.0	-
S Co-60	TLD-11	0.0	0.0	1.0	0.0	1.0
W Co-60	TLD-12	0.0	0.0	0.0	0.0	-
NW Co-60	TLD-13	0.0	0.0	0.0	0.0	-
S Geri I	TLD-14	0.0	0.0	0.0	0.0	-
E Geri I	TLD-15	0.0	0.0	0.0	0.0	-
N Geri I	TLD-16	0.0	0.0	0.0	0.0	-
W Geri I	TLD-17	0.0	0.0	0.0	0.0	-
E Dog	TLD-18	0.0	0.0	0.0	0.0	-
S Site	TLD-19	0.5	0.0	0.0	0.0	0.5
SW	TLD-20	0.0	0.0	0.0	0.0	-
Fen Spec	TLD-21	0.0	0.0	0.0	0.0	-
AH-2	TLD-23	0.0	0.0	0.0	0.0	-
SW AH-2	TLD-24	0.0	0.0	0.0	0.0	-
W Fen	TLD-25	0.0	0.0	0.0	0.0	-
AH-1	TLD-26	0.0	0.0	0.0	0.0	-
Imh	TLD-29	0.0	0.0	0.0	0.0	-
Control	TLD-36	0.0	0.0	0.0	0.0	-

DOE annual public dose limit is less than or equal to 100 mR.
All onsite data have Site background (TLD-35) subtracted out.
A value of 0.0 represents a value below background.

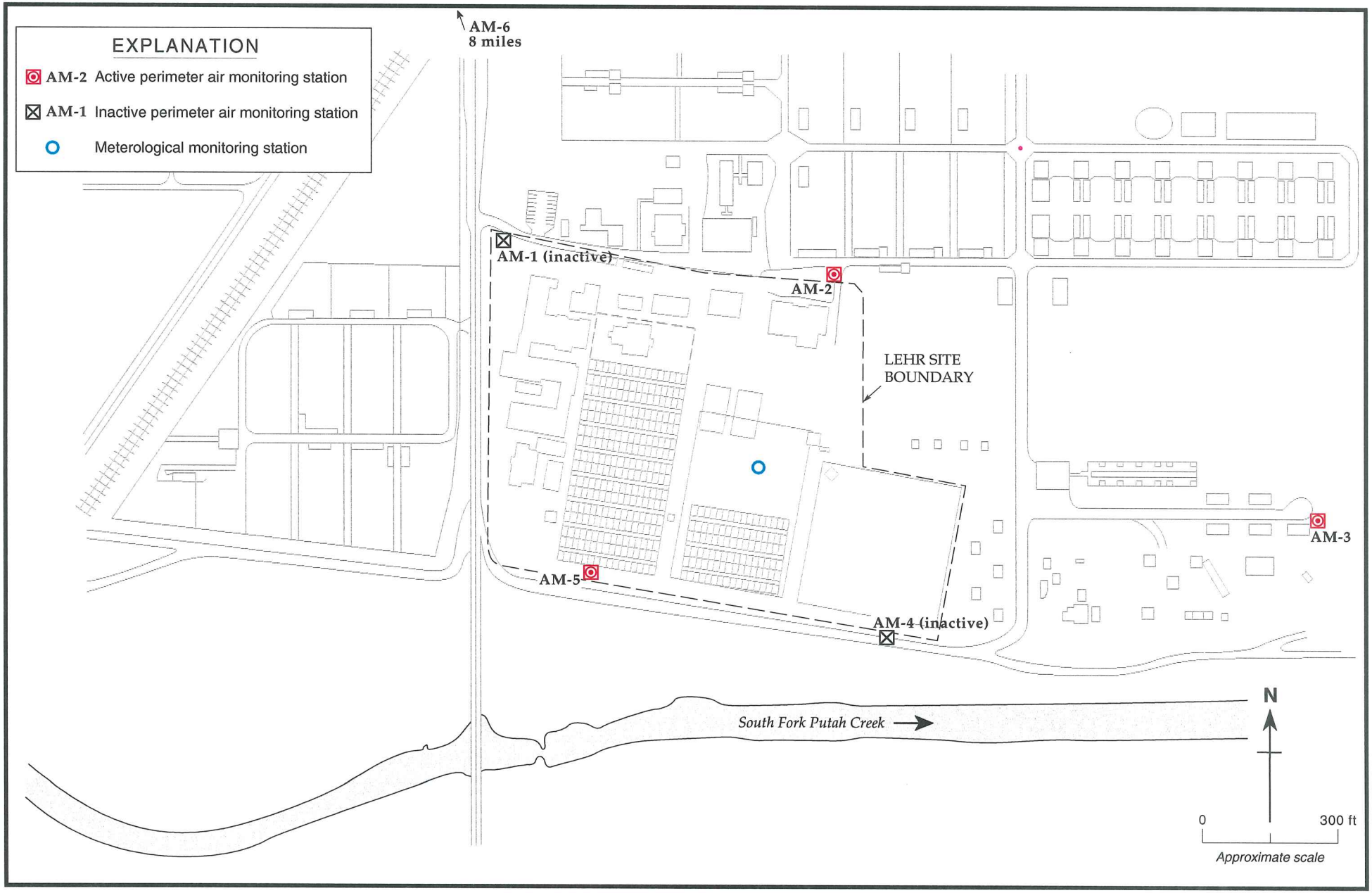

Figure 4-1. On-Site Air Sampling Station Locations, LEHR Site, Davis, California

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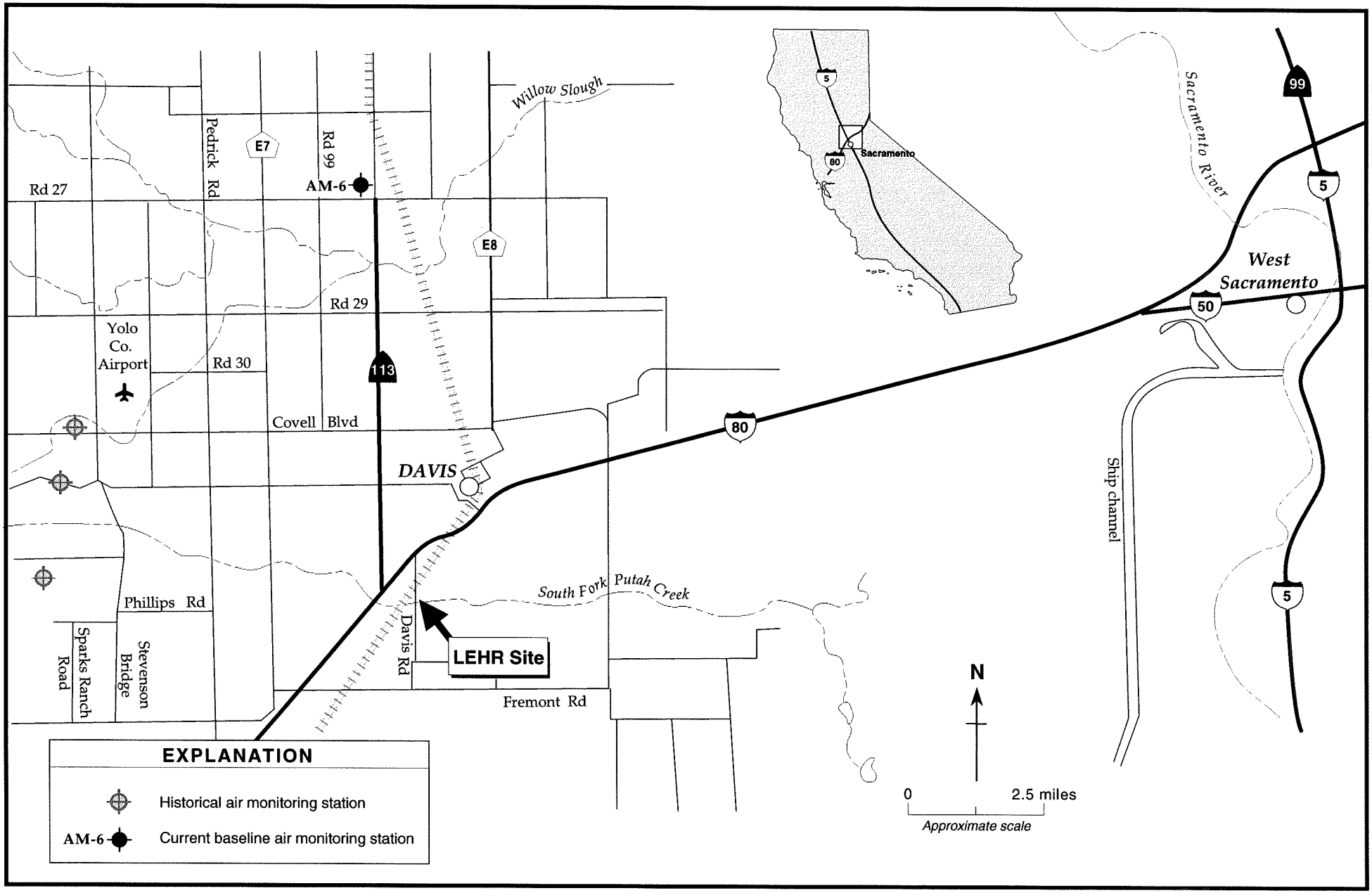

Figure 4-2. Off-Site Air Monitoring Station Locations, LEHR Site, Davis, California

Weiss Associates

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LEHR-S		431	432	433/434
Depths		*7.5 ft*	*10 ft*	*13 ft*
^{226}Ra	*pCi/g*	-	-	0.78/-
^{90}Sr	*pCi/g*	-	0.4	0.4/-
^{14}C	*pCi/g*	2.1	-	-
Gross beta	*pCi/g*	-	17.6	-/-
Cu	*mg/kg*	54	56	55/53
Mn	*mg/kg*	-	-	770/-
Zn	*mg/kg*	84	-	82/-

main office & lab

Building No. H-219 (AH-17)

Former Imhoff Building

Radium Treatment System Septic Tanks Nos. 1 & 2

Location of Domestic Septic System Tank No. 2

Ra-266 Distribution Box Manhole

iron pipes

cobble lined leach trench (91' long x 3' wide x 14' deep)

concrete sidewalk

parking

concrete

fire hydrant

fan

wall

fire alarm

Location of Domestic Septic System Tank No. 1

4" diameter cast iron septic tank effluent line

Tank No.1 cleanout

sanitary sewer line

effluent line termination (5' bgs)

4" diameter cast iron line (tank 5 effluent?) termination (5'bgs)

planter

concrete path

no sand

clean #3 sand

asphalt

automatic gate

OLD DAVIS ROAD

N

0 20 feet

EXPLANATION

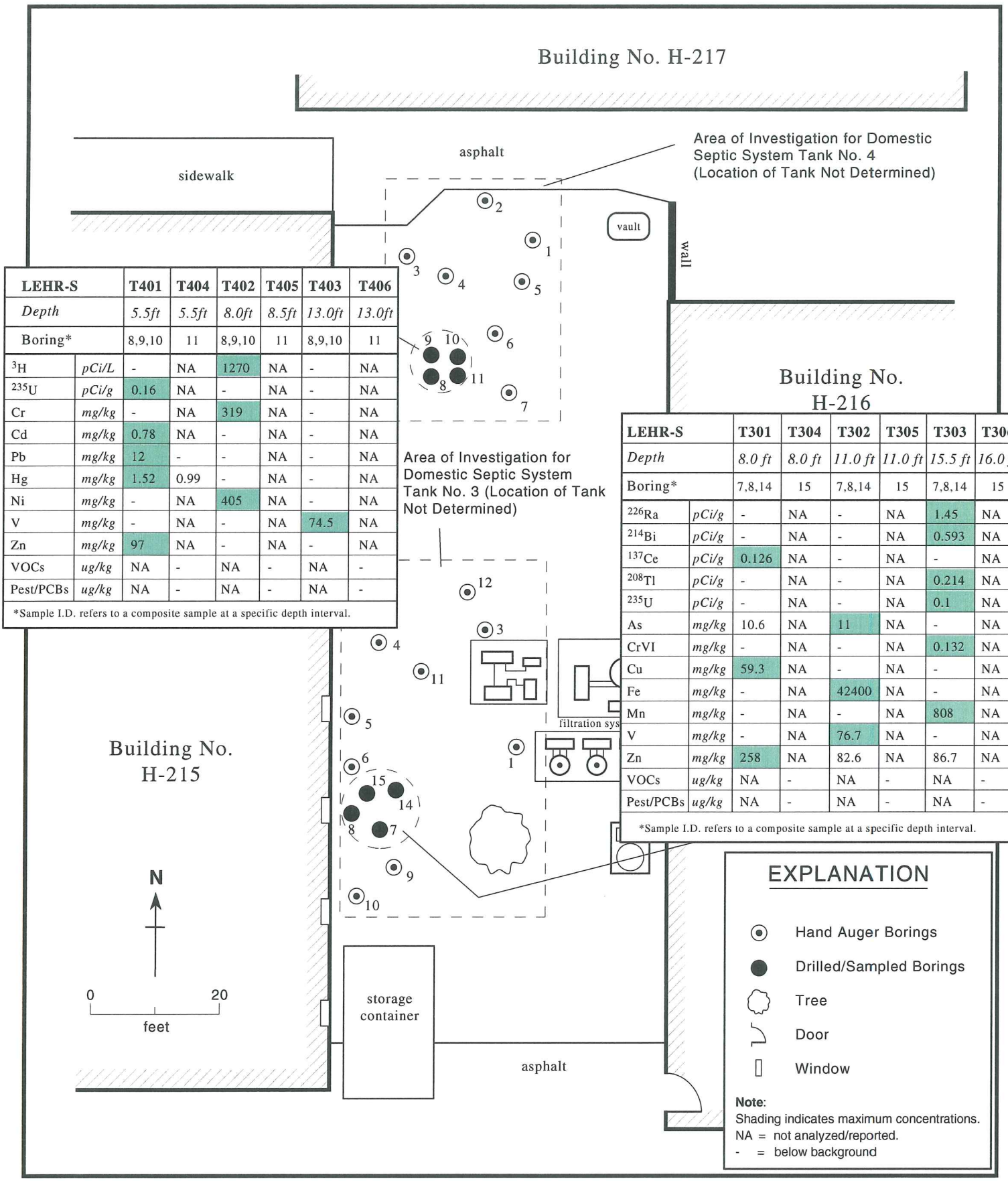
- Hand Auger Borings
- Drilled/Sampled Borings
- Sanitary Sewer
- Radium Drywell
- Manhole cover
- Trench
- Tree
- Fence
- Door
- Brush/shrub
- Ballard

Note:
Shading indicates maximum concentrations.
NA = not analyzed/reported.
- = below background

LEHR-S		T1AO1/02	T1AO5	T1AO3	T1AO6	T1AO4	T1AO7
Depths		*5.0 ft*	*5.0 ft*	*7.5 ft*	*7.5 ft*	*12 ft*	*12.5 ft*
^{226}Ra	*pCi/g*	-/-	NA	-	NA	0.9	NA
^{214}Bi	*pCi/g*	-/-	NA	0.68	NA	-	NA
^{208}Tl	*pCi/g*	-/-	NA	0.211	NA	-	NA
^{3}H	*pCi/L*	340/320	NA	-	NA	-	NA
^{235}U	*pCi/g*	-/0.08	NA	-	NA	0.091	NA
Gross Alpha	*pCi/g*	16.2/-	NA	-	NA	-	NA
Mn	*mg/kg*	-/-	NA	776	NA	-	NA
V	*mg/kg*	-/-	NA	-	NA	73.1	NA
Zn	*mg/kg*	136/-	NA	-	NA	-	NA
Nitrogen, Nitrate	*mg/kg*	16.4/16.9	NA	23.5	NA	-	NA
1.2-DCE	*mg/kg*	NA	-	NA	-	NA	0.004
TCE	*mg/kg*	NA	-	NA	-	NA	0.010
Aroclor-1254	*mg/kg*	NA	-	NA	-	NA	0.091

Figure 4-3. Boring Locations, Trench Locations, and Analytic Results Above Background for Soil Samples, Domestic Septic System No.1 and Radium-226 Leach System, LEHR Site, Davis, California

Weiss Associates



LEHR-S		T401	T404	T402	T405	T403	T406
Depth		*5.5ft*	*5.5ft*	*8.0ft*	*8.5ft*	*13.0ft*	*13.0ft*
Boring*		8,9,10	11	8,9,10	11	8,9,10	11
^{3}H	*pCi/L*	-	NA	1270	NA	-	NA
^{235}U	*pCi/g*	0.16	NA	-	NA	-	NA
Cr	*mg/kg*	-	NA	319	NA	-	NA
Cd	*mg/kg*	0.78	NA	-	NA	-	NA
Pb	*mg/kg*	12	-	-	NA	-	NA
Hg	*mg/kg*	1.52	0.99	-	NA	-	NA
Ni	*mg/kg*	-	NA	405	NA	-	NA
V	*mg/kg*	-	NA	-	NA	74.5	NA
Zn	*mg/kg*	97	NA	-	NA	-	NA
VOCs	*ug/kg*	NA	-	NA	-	NA	-
Pest/PCBs	*ug/kg*	NA	-	NA	-	NA	-

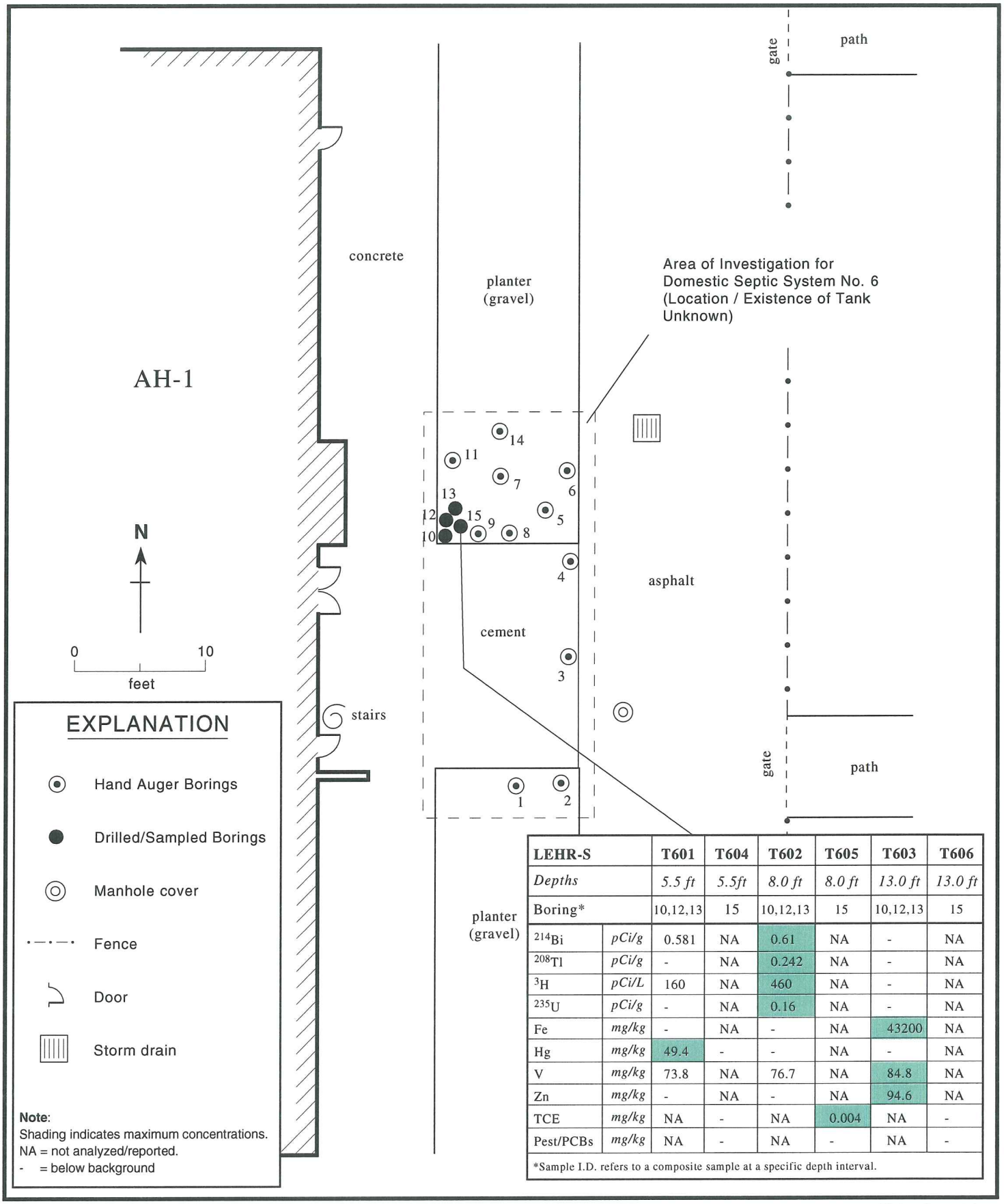
*Sample I.D. refers to a composite sample at a specific depth interval.

LEHR-S		T301	T304	T302	T305	T303	T306
Depth		*8.0 ft*	*8.0 ft*	*11.0 ft*	*11.0 ft*	*15.5 ft*	*16.0 ft*
Boring*		7,8,14	15	7,8,14	15	7,8,14	15
^{226}Ra	*pCi/g*	-	NA	-	NA	1.45	NA
^{214}Bi	*pCi/g*	-	NA	-	NA	0.593	NA
^{137}Ce	*pCi/g*	0.126	NA	-	NA	-	NA
^{208}Tl	*pCi/g*	-	NA	-	NA	0.214	NA
^{235}U	*pCi/g*	-	NA	-	NA	0.1	NA
As	*mg/kg*	10.6	NA	11	NA	-	NA
CrVI	*mg/kg*	-	NA	-	NA	0.132	NA
Cu	*mg/kg*	59.3	NA	-	NA	-	NA
Fe	*mg/kg*	-	NA	42400	NA	-	NA
Mn	*mg/kg*	-	NA	-	NA	808	NA
V	*mg/kg*	-	NA	76.7	NA	-	NA
Zn	*mg/kg*	258	NA	82.6	NA	86.7	NA
VOCs	*ug/kg*	NA	-	NA	-	NA	-
Pest/PCBs	*ug/kg*	NA	-	NA	-	NA	-

*Sample I.D. refers to a composite sample at a specific depth interval.

Figure 4-4. Boring Locations and Analytic Results Above Background for Soil Samples, Domestic Septic Systems Nos. 3 and 4, LEHR Site, Davis, California

Weiss Associates



LEHR-S		T601	T604	T602	T605	T603	T606
Depths		*5.5 ft*	*5.5ft*	*8.0 ft*	*8.0 ft*	*13.0 ft*	*13.0 ft*
Boring*		10,12,13	15	10,12,13	15	10,12,13	15
^{214}Bi	*pCi/g*	0.581	NA	0.61	NA	-	NA
^{208}Tl	*pCi/g*	-	NA	0.242	NA	-	NA
^{3}H	*pCi/L*	160	NA	460	NA	-	NA
^{235}U	*pCi/g*	-	NA	0.16	NA	-	NA
Fe	*mg/kg*	-	NA	-	NA	43200	NA
Hg	*mg/kg*	49.4	-	-	NA	-	NA
V	*mg/kg*	73.8	NA	76.7	NA	84.8	NA
Zn	*mg/kg*	-	NA	-	NA	94.6	NA
TCE	*mg/kg*	NA	-	NA	0.004	NA	-
Pest/PCBs	*mg/kg*	NA	-	NA	-	NA	-

*Sample I.D. refers to a composite sample at a specific depth interval.

Figure 4-5. Boring Locations and Analytic Results Above Background for Soil Samples, Domestic Septic System No. 6, LEHR Site, Davis, California

Weiss Associates

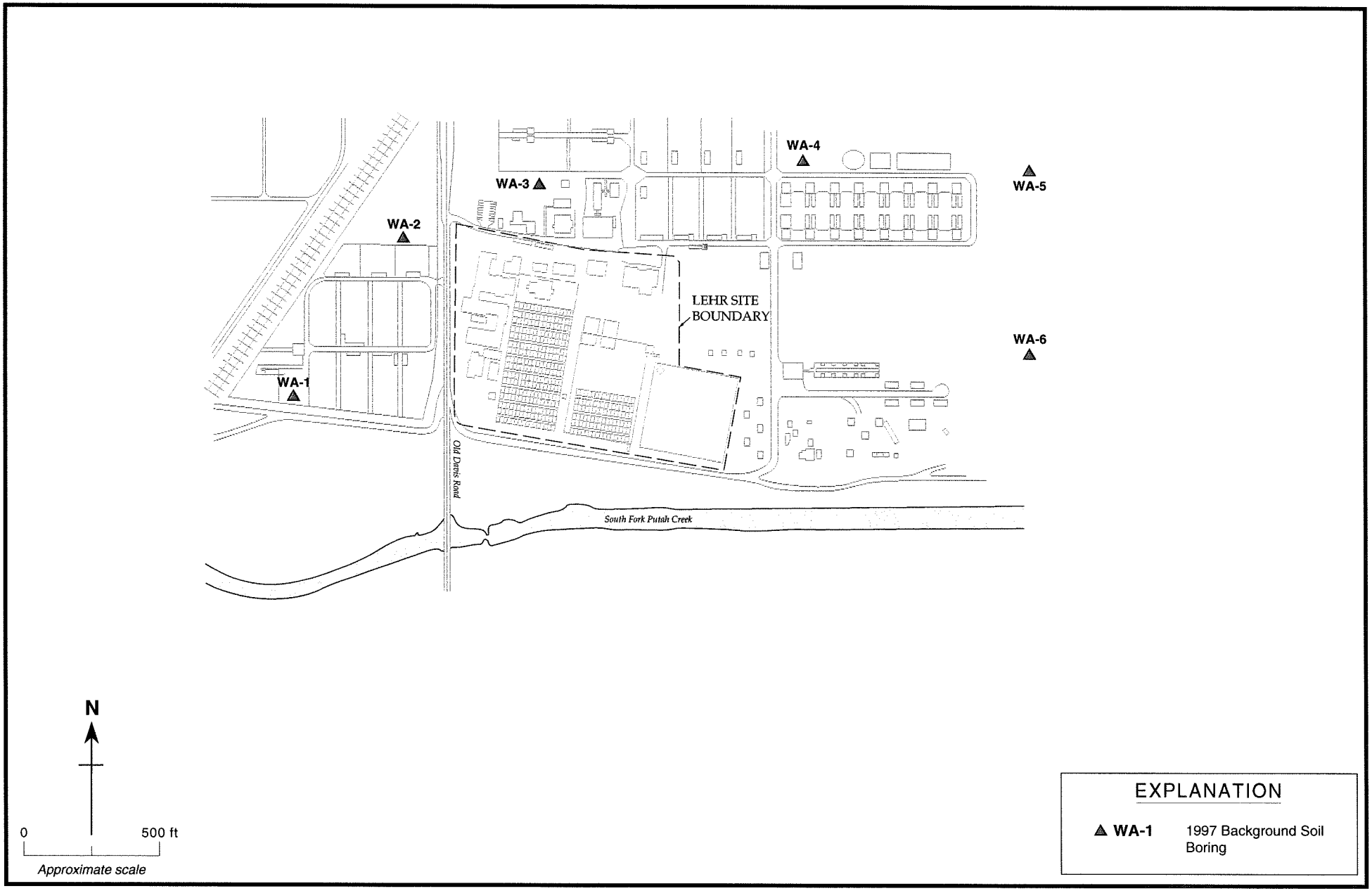


Figure 4-6. 1997 New Background Soil Boring Locations, LEHR Site, Davis, California

Weiss Associates

L272-011.ai

09/14/98

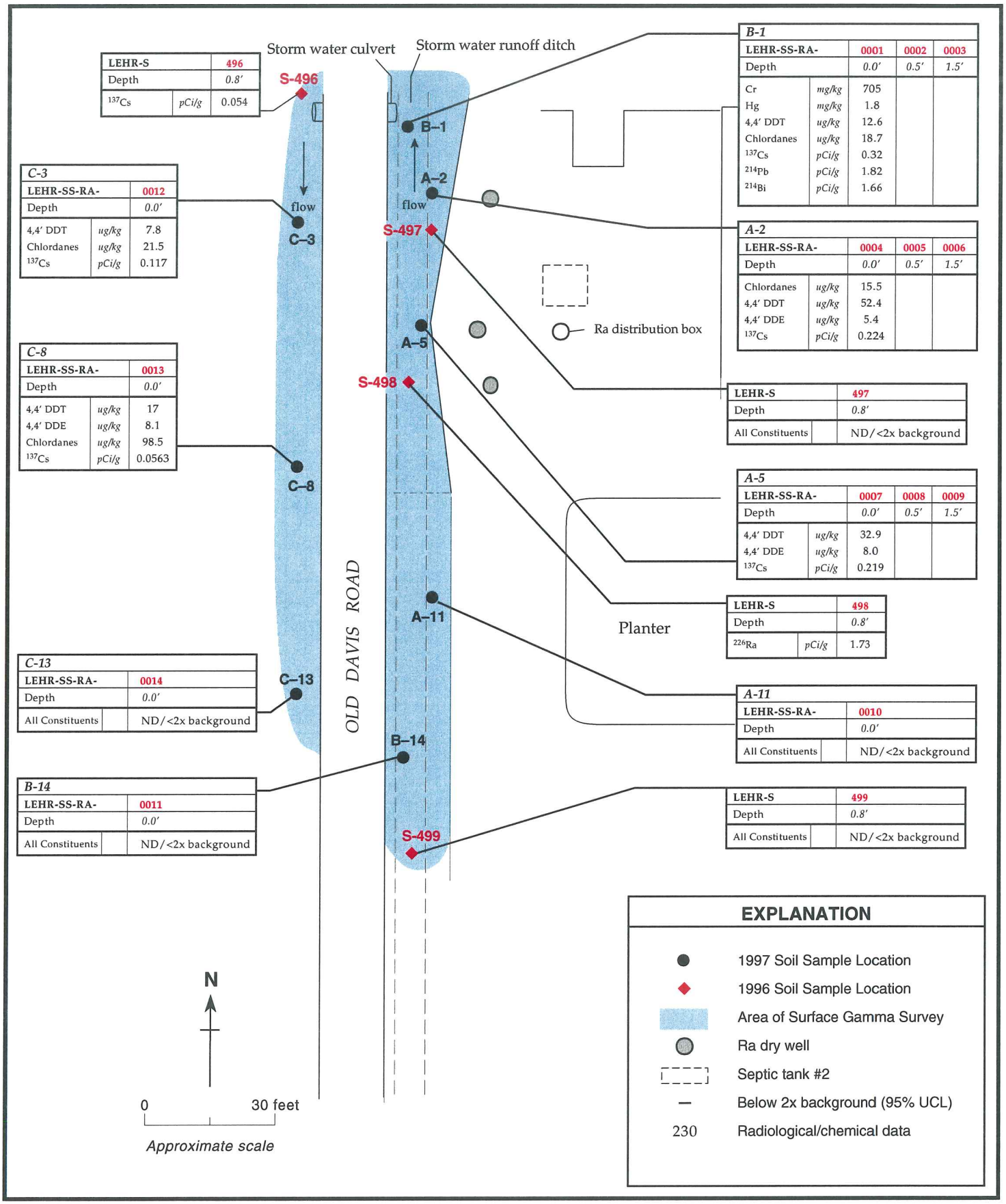


Figure 4-7. 1997 Soil Sampling Locations and Analytic Results for Additional Soil Sampling, Old Davis Road, LEHR Site, Davis, California

Weiss Associates

L272-012.ai

09/14/98

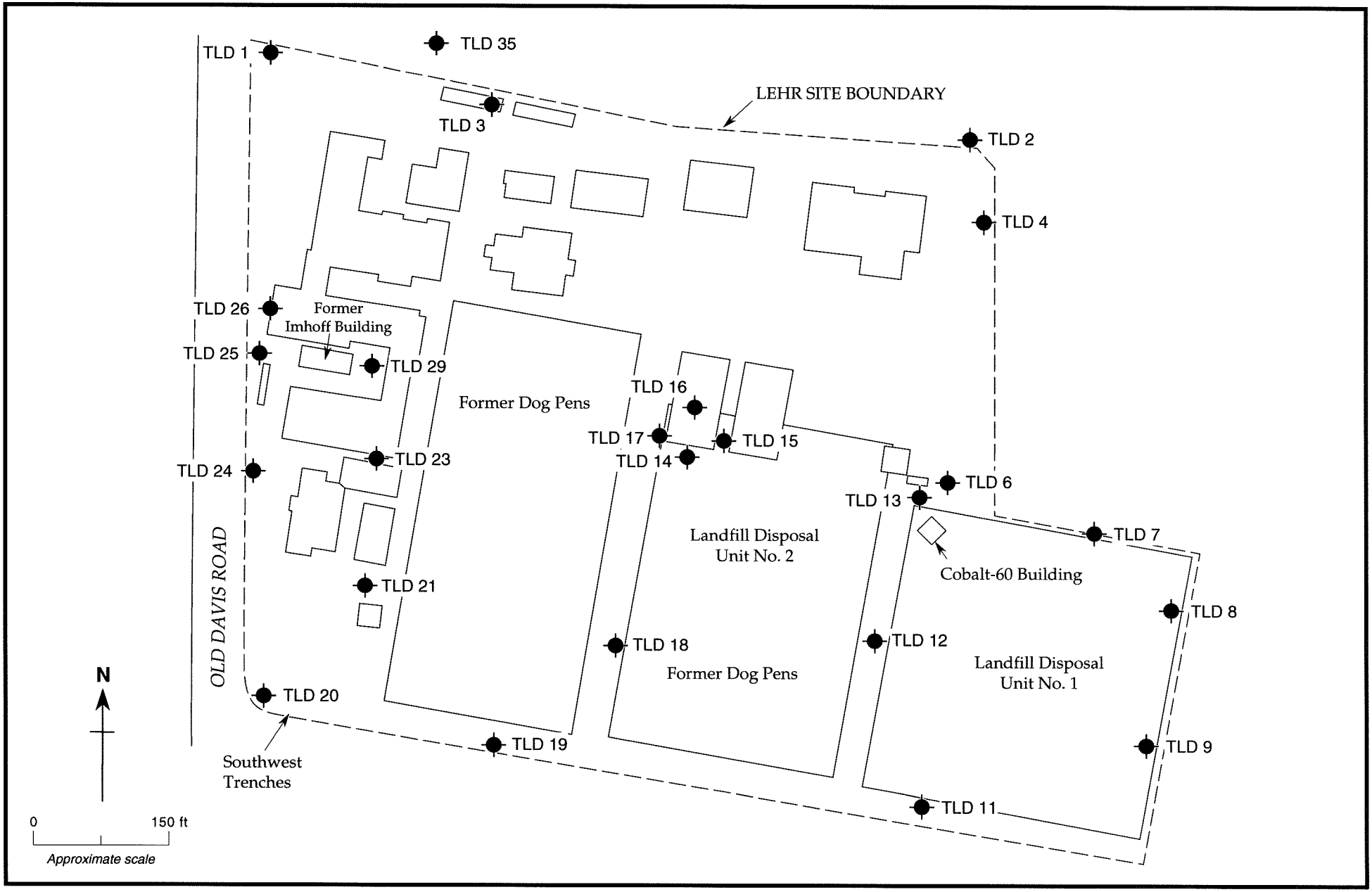


Figure 4-8. TLD Location Map, LEHR Site, Davis, California

Weiss Associates

L272-013.ai

09/14/98

5. ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM INFORMATION

DOE activities at the Site in 1997 focused primarily on additional soil characterization and development of remedial solutions. Significant progress was made during the year toward the characterization of Site air, soil, and water to meet the remaining data requirements for an evaluation of removal action options. This section provides an overview of 1997 non-radiological results for Site air, soil and water and describes significant results and trends. A more detailed discussion of investigations and findings is presented in the reports referenced in each section.

5.1 Non-radiological Air Monitoring

Based upon the results of the one-year baseline air sampling investigation, a reduced air monitoring program was implemented in January 1997. The reduced air monitoring program eliminated quarterly monitoring for non-radiological compounds (chlordane, PM-10, metals, VOCs). During remediation activities planned for 1998, air monitoring for non-radiological compounds will resume to monitor potential emissions during excavation activities.

5.2 Non-radiological Soil Monitoring

As discussed in Section 4, soil sampling was conducted at the Site during the summer of 1997. Areas investigated include the Western Dog Pens, the Domestic Septic Systems, and background and off-site investigations. Results of the Dog Pens and Domestic Septic System field investigations are summarized in the *Final Phase C Addendum to Final Work Plan for Western Dog Pens, Background, and Off-Site Investigations* (Weiss Associates, 1998b), and the *Technical Memorandum Results of Data Gaps Investigation-Domestic Septic Tank Systems* (Weiss Associates, 1998a). The background and off-site investigations are summarized briefly here, and are presented in detail in the *Technical Report, Results of Western Dog Pens, Background, and Off-site Investigations* (Weiss Associates, 1998g)

The following section summarizes 1997 field activities and important analytical results for non-radiological compounds from the DOE areas at the Site.

5.2.1 Domestic Septic Tank Systems

The Domestic Septic Systems were investigated under the DGI. The DGI field work is summarized in Section 4, and is discussed in detail in Weiss Associates, 1998a and 1998g.

Tables 5-1 and 5-2 summarize the results of the 1997 DGI and previous domestic septic system investigations and discuss non-radionuclide compounds detected at levels above their respective background concentrations.

Table 5-1. Significant Non-radionuclide Findings for the Seven Domestic Septic Systems

Domestic Septic Tank Number	Significant 1997 DGI Findings
1	• Investigation of trench T1A, located south of Septic Tank No. 1, detected manganese above the RBAS, and vanadium and zinc below the RBAS but above background levels (Figure 4-3). Nitrate was detected at 23.5 mg/kg in the sample at 7.5-ft depth, less than three times the background level of 10 mg/kg. 1,2-Dichloroethene (1,2-DCE), trichloroethene (TCE), and Aroclor-1254 were also detected in the sample collected from 12.5-ft depth, at low concentrations of 0.004, 0.010, and 0.091 mg/kg respectively.
2	• Not sampled during 1997 DGI. Samples collected adjacent to the Ra-226 Treatment System distribution box during the Limited Field Investigation addressed this septic system. This tank will be removed during the Ra-226 Treatment System RA.
3	• Manganese was detected above the RBAS, arsenic, chromium (VI), copper, iron, vanadium and zinc were detected in some soil samples at concentrations above background but below the RBAS.
4	• Total chromium, cadmium, lead and mercury were detected above the RBAS. Nickel, vanadium, and zinc were detected in some soil samples at concentrations below the RBAS but above background.
5	• Hand auger borings were advanced in the vicinity of Tank No. 5, however, no samples were collected for chemical analysis (Figure 4-5). The tank was not found. However, it is believed that a building has been constructed atop Tank 5 and that the effluent drained to the Septic System No. 1 leach-field. Facility drawings indicate the effluent line from Tank 5 trends in the approximate direction of Domestic Septic System No. 1 leach-field and a pipe was field-located that drains into the leach-field from the purported direction of Tank No. 5.
6	• Iron, vanadium, and zinc were detected in some soil samples at concentrations that are less than two times the background levels. TCE was also detected in the sample collected from 8.0-ft depth, at a low concentration of 0.004 mg/kg. • Mercury was detected at a concentration of 49.4 mg/kg (above the 0.63 mg/kg RBAS) in the sample collected from 5.5-ft depth on 6/12/97 (LEHR-S-T601) (Figure 4-5). However, a significantly lower concentration (0.15 mg/kg) was detected for a co-located sample collected on 9/17/97 (LEHR-S-T604). It was noted that sample LEHR-S-T604 consisted of clayey silt only, whereas sample LEHR-S-T601 consisted of both clayey silt and sand/gravel material. The clayey silt and sand/gravel materials were analyzed (outside the holding time and therefore not validated) separately, on 11/7/97 and 11/12/97 respectively. Mercury was not detected in the clayey silt but was detected in the sand/gravel material at 16.8 mg/kg. The background level for mercury is 0.49 mg/kg.
7	• Not sampled during 1997 DGI. During the 1996 Limited Field Investigation, three soil samples were collected adjacent to the tank. • Barium, copper and manganese were detected above the RBAS.

Table 5-2. Non-radiological Analytes Detected in Soil Above Background, Domestic Septic Systems

Analyte	Background	Max. Conc./Activity	Location	Depth	Date
Cations and Anions (mg/kg)					
Chloride	14	100	Tank 7	12	8/16/96
Nitrate (as N)	10	120	Tank 7	9.5	8/16/96
		23.5	Trench T1A	7.5	6/11/97
Sulfate	36	69	Tank 7	9.5	8/16/96
Metals (mg/kg)					
Arsenic	9.46	11	Tank 3	11	6/12/97
Barium	237	270	Tank 7	9.5	8/16/96
Cadmium	0.46	0.78	Tank 4	5.5	6/12/97
Chromium	178	319	Tank 4	8	6/12/97
Chromium (IV)	0.099	0.132	Tank 3	15.5	6/12/97
Copper	50	56	Tank 1	10	8/19/96
		59.3	Tank 3	8	6/12/97
		60	Tank 7	7	8/16/96
Iron	42,000	42,400	Tank 3	11	6/12/97
		43,200	Tank 6	13	6/12/97
Lead	10.1	12	Tank 4	5.5	6/12/97
Manganese	720	770	Tank 1	13	8/19/96
		808	Tank 3	15.5	6/12/97
		790	Tank 7	7	8/16/96
		776	Trench T1A	7.5	6/11/97
Mercury	0.49	1.52	Tank 4	5.5	6/12/97
		49.4	Tank 6	5.5	6/12/97
Nickel	326	405	Tank 4	8	6/12/97
Vanadium	73	76.7	Tank 3	11	6/12/97
		74.5	Tank 4	13	6/12/97
		84.8	Tank 6	13	6/12/97
		73.1	Trench T1A	12	6/11/97
Zinc	82	84	Tank 1	7.5	8/19/96
		258	Tank 3	8	6/12/97
		97	Tank 4	5.5	6/12/97
		94.6	Tank 6	13	6/12/97
		110	Tank 7	12	8/16/96
		136	Trench T1A	5	6/11/97

Table 5-2. Non-radiological Analytes Detected in Soil Above Background, Domestic Septic Systems (continued)

Analyte	Background	Max. Conc./Activity	Location	Depth	Date
Organics (mg/kg)					
1,2-Dichloroethene	-	0.004	Trench T1A	12.5	9/17/97
Trichloroethene	-	0.010	Trench T1A	12.5	9/17/97
		0.004	Tank 6	8	9/17/97
Aroclor-1254	-	0.091	Trench T1A	12.5	9/17/97
Formaldehyde (mg/kg)	-	2.2	Tank 7	12	8/16/96

5.2.2 Dog Pens Investigation

As described in Section 4, additional investigation was performed in the Western Dog Pens in 1997. Phase A of the investigation consisted of review of historical information, and a general gamma scan was conducted on the Dog Pens gravel. During Phase B, 46 gravel and 75 soil samples, including 4 gravel and 6 soil duplicates, were submitted to GEL for selected radionuclide, organochlorine pesticide, mercury, hexavalent chromium, and nitrate analyses. The results of the radionuclide analyses are discussed in Section 4.

Phase B data for organochlorine pesticide, mercury, hexavalent chromium and nitrate analyses indicate that:

- Chlordane was detected in all but seven gravel samples in concentrations from 0.0003 milligrams per kilogram (mg/kg) to 0.099 mg/kg, and in all soil samples at concentrations from 0.014 to 2.2 mg/kg. Only three soil samples exceeded 0.34 mg/kg (the 10^{-6} excess cancer risk PRG for residential soil): one from pen G-32 at 0.49 mg/kg; one from pen D-25 at 0.77 mg/kg and one from pen E-7 at 2.2 mg/kg.
- The pesticides 4,4-DDD and 4,4-DDT were detected at trace concentrations (0.004 mg/kg or less) in several gravel samples.
- 4,4-DDD, 4,4-DDE, 4,4-DDT, heptachlor and/or heptachlor epoxide were detected at trace concentrations (0.021 mg/kg or less) in many of the surface samples.
- Inorganic constituent levels were representative of background (as defined in Weiss Associates, 1997a), with the exception of:

Constituent	Media	Soil Background	Number of Samples Above Background	Detections >2x Background Maximum Detected (pen ID for maximum)
Mercury	Soil	0.59 mg/kg	36 out of 75	3 of 75 – maximum of 2 mg/kg (G-32)
Hexavalent Chromium	Gravel	0.054 mg/kg	42 out of 46[1]	40 of 46 – maximum of 0.451 mg/kg (D-25)
Hexavalent Chromium	Soil	0.054 mg/kg	10 out of 75	4 of 75 – 0.837 mg/kg (H-30); 0.325 mg/kg (H-30).

[1]Background level is for local soil and may not be appropriate for comparison with this gravel, which is imported.

Identified "hot spots" were of very limited lateral extent.

- There is no discernable intra-pen or inter-pen pattern to the distribution of elevated concentrations.
- No correlation is evident between surface gravel elevated concentrations and organochlorine or metals concentrations reported in soil directly underlying the surface gravel elevated concentrations.

The Phase B results indicate that surface "hot spots" of chlordane (defined here as concentrations greater than 0.5 mg/kg) are few and of very limited lateral extent. Samples adjacent

to the identified elevated concentrations were located as close as 1.2 ft from the elevated concentrations. In all cases, samples adjacent to elevated concentrations were at least an order of magnitude lower than the elevated concentrations. Therefore, based on the Phase B results, elevated concentrations of 1.2-ft radius or smaller may be present in the Western Dog Pens.

Phase A and B results were used to design Phase C of the Western Dog Pens investigations. This investigation was conducted in February, 1998, and focussed on further definition of the vertical extent of COCs.

5.2.3 Background Soil Investigation

The 1997 BI is described in Section 4. As discussed, a statistical analysis of existing and new background data was performed to identify any statistically significant differences between the 1997 data and previously gathered background data, and for depth/soil type variations. For those analytes with no significant differences between data sets, the previously established background levels (Weiss Associates, 1997a) were refined by combining the two data sets and recalculating the background level. Where significant differences between the old and new data sets were identified, the new data were used to calculate a new background level.

Table 5-3 presents the newly established background numbers for metals and nitrate established through statistical analysis and review of BI data.

Table 5-3. 1997 Revised Background Values for Metals and Nitrate

Metal	Former[c] Background Value (mg/kg)	n	Standard Deviation (mg/kg)	Consolidated Data Background Value (mg/kg)	n	Standard Deviation (mg/kg)	Stratified **Clay** Background Value (mg/kg)	n	Standard Deviation (mg/kg)	Stratified **Sand** Background Value (mg/kg)	n	Standard Deviation (mg/kg)
Antimony	0.74[a]	1	N/A	1.4	48	0.77	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Arsenic	9.46	26	1.4	9.6	23	1.4	10	10	1.5	8.5	13	0.85
Barium	237	26	55	260	24	55	290	11	65	210	13	43
Beryllium	0.66	26	0.17	0.72	19	0.17	0.72	10	0.13	0.62	9	0.13
Cadmium	0.46[a]	1	N/A	0.51	48	0.15	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Chromium	178	26	49	181	72	46	130	42	23	218	30	53
Hexavalent Chromium	0.099	26	0.053	0.054	47	0.024	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Cobalt	29	26	5.0	31	24	5.2	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Copper	50	26	11	60	72	11	62	42	11	52	30	10.0
Iron	42,000	26	5,383	44,000	24	5,517	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Lead	10.1	26	1.7	9.5	46	1.3	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Manganese	720	24	98	750	22	96	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Mercury	0.49	26	0.34	0.63	66	0.16	0.23	40	0.11	0.73	26	0.19
Molybdenum	2.0[b]	0	N/A	ND < 0.26	N/A	N/A	ND < 0.26	N/A	N/A	ND < 0.26	N/A	N/A
Nickel	326	26	85	330	72	83	250	42	61	370	30	85
Selenium	1.0	26	0.3	1.2	24	0.37	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Silver	0.52[a]	1	N/A	0.55	48	0.15	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Thallium	1.36[a]	1	N/A	1.6	48	1.1	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A
Vanadium	73	26	11	77	24	11	80	11	12	69	13	10.0
Zinc	82	26	16	87	19	16	93	11	18	64	8	9.9

Table 5-3. 1997 Revised Background Values for Metals and Nitrate (continued)

Metal	Former[c] Background Value (mg/kg)	n	Standard Deviation (mg/kg)	Consolidated Data Background Value (mg/kg)	n	Standard Deviation (mg/kg)	Stratified **Clay** Background Value (mg/kg)	n	Standard Deviation (mg/kg)	Stratified **Sand** Background Value (mg/kg)	n	Standard Deviation (mg/kg)
Nitrate	none	N/A	N/A	36	72	17	Not Stratified	N/A	N/A	Not Stratified	N/A	N/A

Notes:

a = Background set at twice the maximum detected value from the background data set, if positively detected.

b = Background set at the detection limit for compounds with no positively detected concentrations.

c = Background values determined for use in the Risk Based Action Standards Report (Weiss Associates 1997). RBAS background values are the 90% lower confidence limit on the 95th percentile. The RBAS background values were previously reported incorrectly as the 80% lower confidence limit on the 95th percentile. Background values are the 80% lower confidence limit on the 95th percentile for the sample data set.

n = Number of sample concentrations used to calculate background cutoff value.

N/A = Not Applicable

Not Stratified = Statistical tests indicated sample means for clay and sand soil type data were not significantly different.

ND<## = All sample concentrations were below a detection limit of ## in data set.

5.2.4 Off-Site Radium-226 Investigation

As discussed in Section 4, the ORI was performed to more fully define the lateral and vertical extent of potential environmental impacts from overflow of the Ra-226 Leach System and other surface runoff in this area (Figure 1-2). Soil samples were collected from a depth of up to 15 feet in eight locations, and analyzed for radionuclides, pesticides and metals. The sampling locations were selected based on the results of the surface gamma radiation and proximity to the radium-266 dry wells.

Chlordane was detected at a maximum of 0.0934 mg/kg at four of the eight sampling locations, and 4,4-DDT was detected at a maximum of 0.0524 mg/kg in surface samples collected at five locations. Figure 4-7 shows compounds detected at each sampling location.

5.3 Water Monitoring for Non-radiological Constituents

In 1997 ground water and surface water sampling was conducted and reported by UC Davis. DOE sampled only storm water runoff from the Site. Surface water and storm water monitoring results are summarized briefly here, and will presented in detail in the UC Davis's Annual Water Monitoring (Dames and Moore, in progress). Ground water monitoring is discussed in Section 6 of this report.

5.3.1 Surface Water Monitoring

Surface water samples were collected quarterly during 1997 from locations PCU, PCD and STPO (Figure 2-1). 1997 surface water analytic results were very similar to previous years. Six VOCs were reported in surface water samples collected during 1997. These were acetone, bromodichloromethane, bromoform, chloroform, dibromochloromethane, and methylene chloride. One or more of the trihalomethane group (chloroform, bromodichloromethane, dibromochloromethane, and bromoform) were detected well below the total trihalomethane MCL of 100 µg/l at STPO and downstream at PCD. The use of chlorine disinfectants in the UC Davis wastewater treatment plant is the apparent source of these constituents. Methylene chloride was detected at STPO at up to 1.0 µg/l, less than the 5 µg/l MCL. While this is a common laboratory reagent and has been found in blank samples, it is commonly detected in STPO and PCD samples and never in upstream PCU samples, indicating that it is probably introduced to the creek at location STPO. No VOCs were found in surface water samples in concentrations exceeding their MCL in 1997.

The only SVOC detected was bis(2-ethylhexyl)phthalate detected at STPO in the winter at up to 0.70 µg/l. Several pesticides were detected at less than 0.04 µg/l in the summer quarter only. Each quarterly surface water sample was analyzed for 16 metals and hexavalent chromium. None of the metals detected in 1997 exceeded the MCL.

Nitrate concentrations in surface water samples were below the MCL of 10 mg/l (for nitrate as nitrogen) in all 1997 samples. Reported concentrations of nitrate in STPO were higher than in the upstream or downstream samples. This trend has been apparent since 1994.

5.3.2 Storm Water Monitoring

Storm water samples are collected twice a year; once at the beginning of the rainy season after the first storm of the season, and once near the end of the season. The fall 1996 sample results were not received in time to include in the 1996 ASER, and are discussed in this report. In 1998, DOE will collect additional samples to identify potential sources of lead and chlordane in storm water runoff, and to determine if other COCs, such as mercury, may be present at very low levels (Weiss Associates, 1998e).

Acetone, 2-butanone, toluene, and xylenes were detected in storm water samples at concentrations less than the MCLs. Alpha-chlordane and gamma-chlordane were detected at less than 0.017 µg/l, below the 0.1µg/l MCL at LS-1 in the spring quarter. No other pesticides were detected, and no SVOCs were detected.

Metals were detected in all samples. Antimony, chromium, iron, lead, manganese and nickel were detected at concentrations exceeding the respective MCLs at one or more locations in the winter 1996 and spring 1997 sampling. However, these samples were not filtered prior to field preservation, resulting in the dissolution of suspended materials and anomalously high concentrations of some metals. Field filtration was performed during subsequent sampling events and only iron was detected above the MCL (iron was detected at 910 µg/l, exceeding the 300 µg/l MCL at LF-3 in fall 1997). Iron has historically been detected intermittently above the MCL, and this result is consistent with previous years.

5.3.3 National Pollutant Discharge Elimination System (NPDES) Data

The Site discharges its sanitary waste to the UC Davis Wastewater Treatment Plant, which is permitted according to NPDES requirements. Current DOE activities do not contribute to hazardous discharges.

6. GROUND WATER PROTECTION PROGRAM

Ground water monitoring has been conducted quarterly for the LEHR ER/WM Project since November 1990. The quarterly monitoring program began as a component of the Phase II Site Characterization (Dames & Moore 1993). In 1993, the program evolved to include the development of a Site Water Monitoring Plan, designed to meet the requirements of DOE's General Environmental Protection Program in DOE Order 5400.1.

Water monitoring is conducted in conjunction with the CERCLA process as part of the DOE-sponsored environmental restoration program underway at the Site. Since LEHR has not been an operational Site since 1989, the current water monitoring program focuses primarily on environmental surveillance activities for non-operational facilities. Figure 2-1 shows the location of ground water monitoring wells for the Site.

The objectives of the ground water monitoring program are to characterize baseline ground water conditions at the Site; to further evaluate impacts of previous LEHR facility operations on ground water in the area; to provide data to support future Site activities (risk assessment and remedial actions); and, to comply with applicable federal, state and local regulations.

In 1997 all ground water and surface water monitoring at the Site was performed and will be reported by UC Davis except for storm water sampling from DOE areas.

6.1 Hydrology

The hydrogeology of the Sacramento Valley is comprised of both unconfined and confined aquifers in the flat or gently sloping sedimentary deposits in the upper 3,000 feet beneath the valley. No regionally identified confining units are known to exist in the Sacramento Valley. Ground water is recharged through leakage from streams and rivers, as well as from direct precipitation and irrigation (DOE, 1992b).

Ground water is encountered beneath the Site at depths ranging seasonally from about 20 to 70 feet below ground surface. The water levels are usually highest in early spring and lowest in summer. Based on analysis of subsurface stratigraphy, the uppermost aquifer has been separated for investigation purposes into two hydrostratigraphic units (HSUs). A hydraulic connection does exist between these two layers, as evidenced by comparison of hydrographs. Water levels in both HSUs show the characteristic rise during fall and winter, and the same decline during spring and summer. However, the two HSUs are distinctly different water-bearing zones with different characteristics. Deeper HSUs have not been investigated below the Site, although they are known to exist on a regional basis (DOE, 1994b).

Hydraulic testing performed on well EW2-1 indicates that the hydraulic conductivity of HSU-2 is approximately 750-1,200 ft/day, transmissivity is approximately 33,000-52,000 ft^2/day, and storativity is estimated at 0.0005 to 0.0067 (Dames and Moore, 1997a).

The direction of ground water flow in HSU-1 is generally toward the northeast, although local temporary changes in flow direction and gradient occasionally occur. Local horizontal ground water gradients across the Site in the first HSU vary from approximately 0.002 to 0.003 ft/ft (Dames and Moore, 1997b, 1998a, 1998b).

In the second HSU, ground water flow is predominantly toward the east/northeast. Both the direction of flow and the lateral gradient are more consistent than in the first HSU. Horizontal gradients in HSU-2 range from 0.0007 to 0.0015 ft/ft (Dames and Moore, 1997b, 1998a, 1998b). Generally, gradients are lower in winter and fall, while higher gradients occur in spring and summer.

6.2 Uses of Ground Water in Vicinity

Local ground water is utilized for both drinking and agricultural purposes. The major ground water sources for both public and private water supplies in the Sacramento Valley are the unconsolidated deposits of Pliocene and Pleistocene age, and the older alluvium (DOE, 1995). The first HSU and is not used for drinking or irrigating purposes. In the general area near the Site, a number of domestic and irrigation wells draw from HSU-2.

6.3 Potential Sources of Ground Water Pollution

Studies of potential sources of ground water pollution have not determined the extent of the environmental impact of Site sources, although additional data are being collected and analyzed. A number of locations on-site are considered "waste management areas," where a variety of potential wastes were handled and/or buried during former Site operations. Impact from these areas has been evaluated during previous investigations and may be further evaluated during future investigations and/or remedial actions. Most impacts to ground water that have been identified are localized on the Site near waste burial locations and are within the first HSU, which is not used for drinking water. The primary waste management areas include: the Imhoff treatment system, the radium-226 treatment system, domestic septic tanks (reported to have received project effluent), chemical dispensing areas, waste burial trenches, landfill units, dog pen areas, and dry wells for storm water (storm water may have carried wastes from other management areas).

6.4 Vadose Zone Transport Modeling

One-dimensional contaminant transport modeling was performed in late 1996/early 1997 to assess potential ground water impact resulting from downward migration of contaminants through the unsaturated sediments in the DOE areas beneath the LEHR facility. The scope of the modeling was limited to DOE areas of concern at the Site. The model results provided guidance for estimating

Site soil clean-up levels and evaluating planned removal actions, as well as input to the risk evaluation.

The results of the modeling indicated that observed levels of strontium-90, radium-226, and chlordane in soil should not impact ground water above either the 95% Upper Threshold Limit (UTL) approximations of background or MCLs. The results also indicated that maximum observed concentrations of hexavalent chromium in shallow soil may exceed the 95% UTL, but should not impact ground water above the total chromium MCL (50 µg/l).

The model results indicate that concentrations of nitrate above preliminary background values may impact ground water above both the nitrate as nitrogen MCL (10 mg/l) and the 95% UTL. Based on conservative assumptions in the modeling procedure, peak concentrations predicted by these models are conservative estimates and, therefore, should represent an upper limit of concentrations that may impact ground water. These results are discussed in detail in the Draft Final One-Dimensional Vadose Zone Modeling Report (Weiss Associates, 1997c).

In 1997, soil sampling was performed to provide additional data for the re-calculation of background soil concentrations. Additional modeling using these updated background values was performed in early 1998. The results of this modeling will be discussed in the Removal Actions Workplan (Weiss Associates, 1998d).

6.5 Ground Water Monitoring

In 1997, in accordance with the MOA between DOE and UC Davis, responsibility for surface water and ground water sampling was transferred to UC Davis. The ground water monitoring program discussed in this section is under the jurisdiction of, and is performed by, UC Davis. This monitoring program is summarized here and will be discussed in more detail in UC Davis's Annual Water Monitoring Report (Dames and Moore, in progress). A table summarizing constituents detected in ground water in 1997 is included as Appendix A.

Quarterly ground water samples were collected in February, May, August and November, 1997. The sampling frequency and requested analytes followed the specifications of the Water Monitoring Plan. All well locations are shown in Figure 2-1.

6.5.1 Ground Water Well Installation

In 1997 UC Davis installed ten new ground water monitoring wells as part of the Interim Remedial Action. Six wells (UCD2-32, UCD2-36, UCD2-37, UCD2-38, UCD2-39, and UCD2-40) were installed in HSU-2 to further assess ground water quality and migration. Four wells (UCD4-33, UCD4-41, UCD4-42 and UCD4-43) were installed in HSU-4 to assess ground water quality and potential vertical migration downgradient of the Site. Well UCD4-33 was sampled in the fall of 1997, however, due to a break in the well screen, the well was subsequently abandoned by pressure grouting. In addition a remedial injection well, IW2-1 was installed upgradient of the Site. All well locations are shown in Figure 2-1.

6.5.2 Radionuclides

Radionuclides detected in 1997 ground water samples are summarized in Appendix A. Results of the radiological analyses indicated that americium-241, bismuth-212, bismuth-214, carbon-14, gross alpha and gross beta, lead-214, plutonium-241, radium-226 and thallium-208 were detected in Site wells at slightly above the MDAs. H-3 was detected above the MDA, but below the 20,000 piC/l MCL in eight Site wells during 1997. The maximum H-3 concentration of 19,400 piC/l was detected in well UCD1-13. These results are consistent with previous years, and no new trends were identified.

6.5.3 Volatile Organic Compounds

VOCs detected in 1997 ground water samples are summarized in Appendix A. Observed trends in 1997 analytical results were not significantly different than previous years for the majority of wells. Except for UCD1-12, VOCs were detected mostly in HSU-2.

Chloroform was the most frequently detected VOC and was found in nineteen wells, with a maximum concentration of 7,900 µg/l detected in UCD1-12. These results are consistent with previous years and exceed the 100 µg/l MCL for total trihalomethanes. Chloroform was detected in each of the new HSU-4 wells at 5.1 to 37 µg/l. 1,1-Dichloroethane, 1,1-Dichloroethene, and 1,2-Dichloroethane were detected in at least one well at concentrations exceeding their respective MCL. The maximum concentration for all of these compounds was detected in UCD1-12, which is consistent with previous years. Bromodichloromethane, 1,2-Dichloropropane, 1,3-Dichlorobenzene and 1,1,2-Trichloroethane were detected at concentrations above the quantitation limit, but not exceeding the MCL.

6.5.4 Semivolatile Organic Compounds

A summary of SVOCs detected in ground water samples is presented in Appendix A. Seven SVOCs were detected in 1997 ground water samples at up to 8.4 µg/l. These compounds were only sporadically detected and no definite trends are evident. No SVOCs were detected above the MCL.

6.5.5 Pesticides and PCBs

A summary of organochlorine pesticides and polychlorinated biphenyls (PCBs) detected in 1997 ground water samples is presented in Appendix A. Eight pesticide compounds were reported in 1997 ground water samples; 4,4'-DDD, alpha chlordane, dieldren, endrin, endrin keytone, gamma-BHC (lindane), gamma-chlordane and heptachlor. Of these, only dieldrin was detected above the quantitation limit at 0.03 µg/l in UCD1-13. No PCB compounds were reported in 1997 ground water samples.

6.5.6 Metals

A summary of metals detected in 1997 ground water samples is presented in Appendix A. Arsenic, barium, calcium cobalt, copper, lead, magnesium, molybdenum, potassium, selenium, sodium, vanadium and zinc were detected in Site wells. None of these compounds exceeded their respective MCL. Antimony, iron, nickel and manganese were detected at concentrations exceeding their primary or secondary MCLs.

Total and hexevalent chromium are detected consistently in most site wells, and exceeded the 50 mg/l MCL in most HSU-1 wells, two HSU-2 wells, and no HSU-4 wells. It is interesting to note that the two highest detections for total chromium (in UCD1-25 and UCD1-28) are in wells located in close proximity to the well with the lowest result (UCD1-27). No definite pattern of contamination related to site burial areas is discernable for chromium, although results from each well are very consistent over time.

6.5.7 General Chemicals

Alkalinity, ammonia as nitrogen, chemical oxygen demand, chloride, phosphorus, and sulfate were monitored in site wells in 1997, and were generally detected at or below background. TDS exceeded the 500 mg/l secondary MCL in many wells. These results are consistent with previous years. Total organic carbon and total kjeldahl nitrogen were monitored for the first time in 1997.

Nitrate as nitrogen was detected above the 10 mg/l MCL in many samples collected from HSU-1 but only two samples collected from HSU-2. The highest concentrations were detected in UCD1-24 (92.1 mg/l), which has shown increasing levels for several years. Concentrations also appear to be increasing in UCD1-10. Concentrations in all other wells have been relatively consistent over time.

6.6 Off-Site Neighbor Well Sampling

Sampling of private wells to the south, north, and east of the Site has been conducted since 1989. Because the wells are not uniform in dimension or construction, limited comparisons can be made between these wells and Site ground water data. The off-site neighbor well sampling program has provided information about the quality of water in private domestic and irrigation wells regarding the primary Site COCs: VOCs, H-3, hexavalent chromium, nitrate as nitrogen, gross alpha and gross beta. Private wells sampled in 1997 are shown in Figure 6-1.

In 1997, UC Davis sampled selected irrigation and domestic wells to the east of the Site four times. Hexavalent chromium and nitrate as nitrogen were detected in many of the wells. These compounds are present in regional ground water, and no direct link to the Site has been established.

Analyses for VOCs were added to the off-site well monitoring program in 1995 to provide additional information regarding the extent of chloroform in ground water. In 1997 chloroform was detected in four off-site wells: concentrations of less than 2 µg/l were reported in 22A, 22P2 and 22J, and concentrations of up to 31 µg/l were reported in 22N. Low concentrations (less than 1 µg/l) of

1,2-dichloroethane, 1,1-dichloroethane and 1,2-dichloropropane were also detected in well 22N. These results are similar to the 1996 monitoring results. In 1997 three new monitoring wells were installed to the east of the Site, near well 22N. These wells will assist in more fully defining ground water quality in this area.

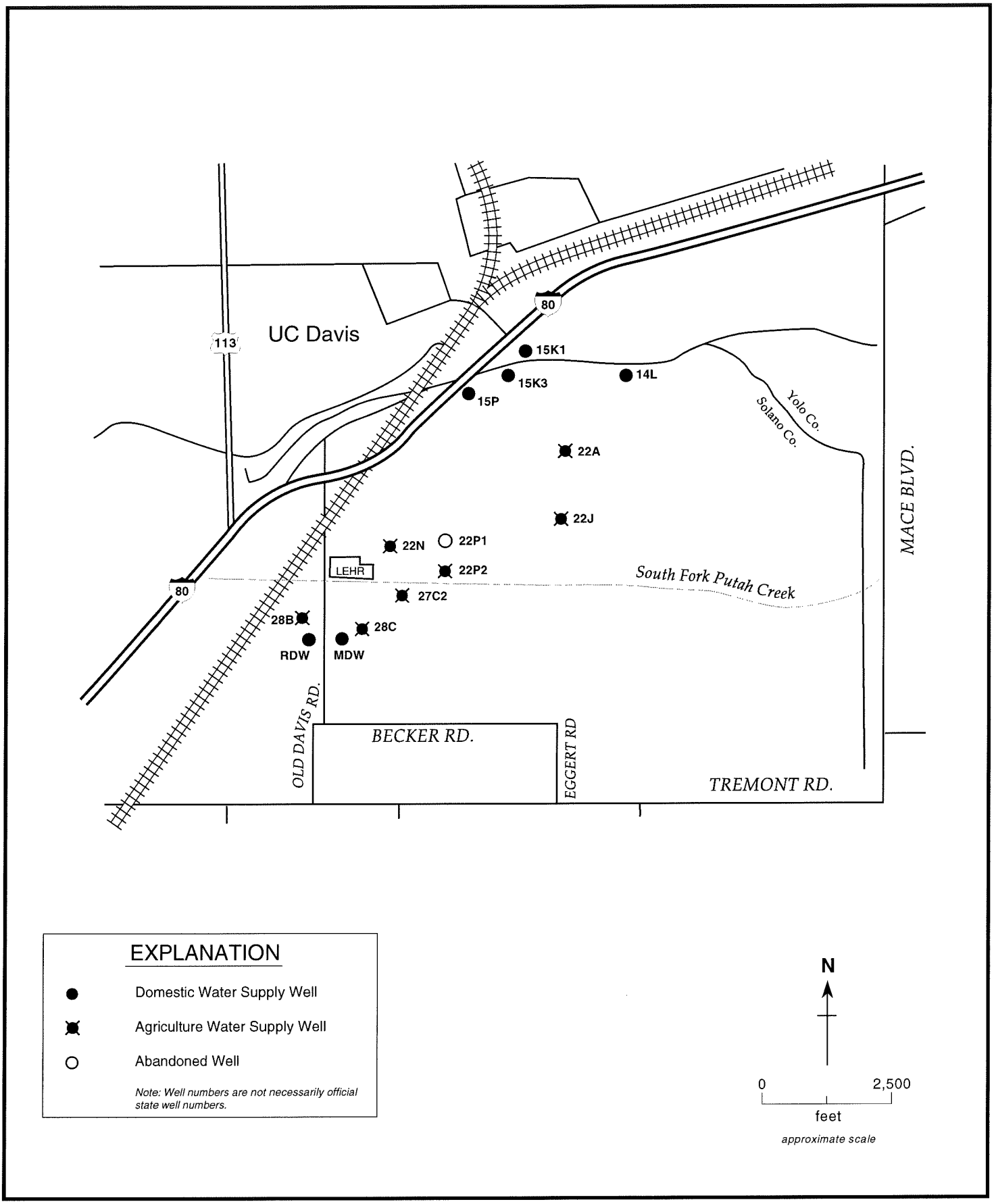


Figure 6-1. Neighbor Well Sampling Program Locations Near the LEHR Site, Davis, California

Weiss Associates

7. QUALITY ASSURANCE

Quality assurance (QA) is a key element of the environmental protection program for the Site. A Quality Assurance Project Plan (QAPP) that describes the requirements for all quality-related work on the LEHR project has been prepared, reviewed by DOE, and finalized (Weiss Associates, 1998h). In the planning for each phase of the LEHR ER/WM Project (Site characterization, investigation, D&D actions, etc.) this QAPP and other quality-assuring documents, such as Standard Quality Procedures (SQPs), Standard Operating Procedures (SOPs) and task-specific workplans are followed. The purpose of the QAPP and these other documents is to identify the specifications and methods employed to establish technical accuracy and precision, validity of measurements and statistics, and to provide a sound basis for management decisions that will be based on environmental information collected for the Site. The QAPP for the LEHR ER/WM Project was prepared in accordance with EPA QAMS-005/80 and National Quality Assurance (NQA)-1 specifications. It also incorporates guidance from DOE Order 5700.6C and the General Environmental Protection Program as defined in DOE Order 5400.1, to ensure that DOE quality and environmental goals are met.

Environmental samples discussed in this report were collected, analyzed and reviewed according to the QAPP and other relevant SOPs and/or task-specific workplans. To assure quality, quality control (QC) is integrated into all aspects of environmental sampling. Included in the QAPP and related documents are sections identifying QC for sample collection requirements and specific quality assurance objectives for the measurement data. QC samples are run with each sample batch at the laboratory to validate the method of analysis and the proficiency of the analyst. Because holding times are an important factor in the sample quality, these are carefully controlled. To ensure the comparability of analytical data, all samples are analyzed by EPA-approved methods when available. When analytic results are received, they are reviewed by the contractor according to the defined data quality objectives and data review procedures.

Virtually all of the 1997 environmental sample data for Site air, soil and water were collected under the strict quality assurance requirements of the CERCLA process. Most of these data have been carefully reviewed and validated as required by the QAPP. Most of the 1997 Site air, soil and water monitoring data have been, or will be, presented in separate reports. The individual review and validation process for each data set is presented in these reports, and will not be discussed in detail here.

7.1 Field Quality Assurance

Quality assurance for field sampling is accomplished by the use of field replicates, decontamination rinseates, trip blanks and field blanks, as appropriate for the type of sample collected. For each round of sampling, duplicate samples are collected from a selected sample point at the same time as the original sample to check for consistency in the sampling process. The

duplicate sample serves as a check on the precision of the sampling and analytical procedures. Decontamination rinseates are analyzed whenever the potential exists for cross-contamination from sampling equipment. Trip blanks are sent with each shipment of water samples requiring analysis for volatiles. Field blanks are collected to check for contamination during the water sampling process. Calibration records for each field instrument are maintained in the contractor QA files.

7.2 Laboratory Quality Assurance

Contracted laboratories providing analytical services for the LEHR ER/WM Project are evaluated by UC Davis and/or Weiss Associates to assure compliance with the QA program requirements. Laboratory quality assurance is analyzed externally by the submission of split samples, spiked samples, and blanks to the laboratories analyzing environmental samples. Laboratories must submit their analytical procedure for review if it differs from standard procedures. Each contract laboratory is required to maintain participation, as applicable, in DOE, State of California, and/or EPA approved interlaboratory QA programs such as DOE's' Environmental Measurement Laboratory interlaboratory comparison program, or EPA's Water Pollution/Water Supply Program.

In 1997 most of the environmental samples collected at the Site were submitted to either GEL or Lockheed Analytical Services (LAS). On January 19, 1998 LAS closed, apparently for financial reasons. Analysis of most of the LEHR samples submitted before the closure was completed within the required holding time. However, SVOC and pesticide analyses were not completed for all of the fall storm water samples. Additionally, both hard copy and electronic format data reports were significantly delayed, and some of the electronic data were never received. Most Site environmental samples are now sent to GEL, with the exception of fish toxicity and radiation dosimeter analyses which are sent to specialized laboratories.

7.3 Quality Assurance Program Audit and Surveillance Activities

Contracted laboratories that perform environmental analyses for the project are subject to periodic audits of their QA program to assure compliance with project standards. Several QA field audits were performed in 1997. These audits covered soil sample collection/packaging/shipping procedures, lithologic logging, and other field documentation. All findings and observations identified during the audits were addressed in a timely manner, and these audits are considered closed.

7.4 Summary of Quality Control Data Validation

The overall quality assurance objective is to collect and analyze environmental samples from the Site in a manner that ensures technical data are accurate and representative, are able to withstand scientific and legal scrutiny, and are useful for evaluating Site conditions and remedial actions. The criteria used to specify QA goals are precision, accuracy, representativeness, completeness, and comparability (PARCC) for evaluation of QC data. An evaluation of the PARCC parameters is

accomplished through data validation. Table 7-1 summarizes the components that are used to monitor and evaluate the quality of LEHR environmental data.

Table 7-1. Components of QC Program in Support of Data Quality Objectives

Data Quality Objective	QC Component	Evaluation Criteria
Precision	• Field duplicate • Matrix spike • Matrix spike duplicate	Relative percent difference
Accuracy	• Matrix spike • Matrix spike duplicate • Surrogate spikes	Percent recovery
Representativeness	• Trip blanks • Field duplicate • Method blanks	Qualitative degree of confidence
Completeness	• Holding time • Valid data points	Percent valid data
Comparability	• Analytical methods • Field duplicates	Qualitative degree of confidence

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9. ACKNOWLEDGMENTS

The following LEHR Project personnel worked on the 1997 ASER:

Name and Position	Responsibility
Michael Dresen LEHR Program Manager, WA	Senior guidance and review, and quality assurance
Robert Devany LEHR Project Manager, WA	Project management, guidance and review.
Salem Attiga Principal, EMS	Senior review
Mary Stallard LEHR Quality Assurance, WA	Technical guidance and review, and quality assurance
Alison Watts Project Geologist, WA	Project coordination, report writing
David Bucky Database Technician, WA	Database management
Craig Adams Graphics, WA	Graphics
Nerissa de Jesus Project Administrator, WA	Word processing and report coordination
Ed Chun Production Personnel, WA	Graphics and report production

APPENDIX A

ANALYTIC RESULTS FOR WATER

(From Dames and Moore, 1998d)

TABLE 5.3
NUMBER OF DETECTIONS, POSITIVE AND MAXIMUM VALUES IN HSU-1 GROUNDWATER DURING 1997
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

				UPGRADIENT WELLS						DOWNGRADIENT WELLS					
	PARAMETER		MCL	Number of Results	Number of Detections	Number >MCL	Maximum Value	Date of Maximum Value	Location of Maximum	Number of Results	Number of Detections	Number >MCL	Maximum Value	Date of Maximum Value	Location of Maximum
Metals	ANTIMONY	ug/L	6	1	0		--	--	--	18	10	**1**	9.3	02/13/97	UCD1-004
	ARSENIC	ug/L	50	1	1		4	02/20/97	UCD1-018	18	15		9.3	02/19/97	UCD1-019
	BARIUM	ug/L	1000	1	1		172	02/20/97	UCD1-018	18	18		437	02/18/97	UCD1-012
	CALCIUM	ug/L		1	1		38600	02/20/97	UCD1-018	18	18		74400	02/18/97	UCD1-013
	CHROMIUM	ug/L	50	1	1		21.8 |Jn	02/20/97	UCD1-018	18	17	**10**	577	11/24/97	UCD1-028
	CHROMIUM, HEXAVALENT (+6)	ug/L		2	2		18	02/20/97	UCD1-018	37	35		529	11/24/97	UCD1-028
	COBALT	ug/L		1	1		1.8 B|Jn	02/20/97	UCD1-018	18	15		4.4 B|	02/18/97	UCD1-012
	COPPER	ug/L	1300 #	1	1		1.7 B|Jn	02/20/97	UCD1-018	18	16		13.7	11/24/97	UCD1-028
	IRON	ug/L	300 S	2	0		--	--	--	18	2	**2**	1570 E|Jn	05/20/97	UCD1-027Z3
	LEAD	ug/L	15	1	0		--	--	--	18	2		3.7	05/19/97	UCD1-034
	MAGNESIUM	ug/L		1	1		100000	02/20/97	UCD1-018	18	18		215000	02/18/97	UCD1-012
	MANGANESE	ug/L	50 S	1	0		--	--	--	18	10	**2**	1310	05/20/97	UCD1-027Z3
	MOLYBDENUM	ug/L		1	1		1.4 B|	02/20/97	UCD1-018	18	12		9.1 B|	02/28/97	UCD1-027Z3
	NICKEL	ug/L	100	1	1		10.7 B|Jn	02/20/97	UCD1-018	18	18	**2**	218	05/20/97	UCD1-027Z3
	POTASSIUM	ug/L		1	0		--	--	--	18	4		1650 B|	02/28/97	UCD1-027Z3
	SELENIUM	ug/L	50	1	1		5.6	02/20/97	UCD1-018	18	15		30.2	02/18/97	UCD1-010
	SODIUM	ug/L		1	1		34800	02/20/97	UCD1-018	18	18		182000	02/18/97	UCD1-010
	VANADIUM	ug/L		1	1		5.6 B|	02/20/97	UCD1-018	18	13		16.1	05/19/97	UCD1-034
	ZINC	ug/L	5000 S	1	1		4.2 B|Jn	02/20/97	UCD1-018	18	17		32.9	05/19/97	UCD1-025
General Chemical Parameter	ALKALINITY, TOTAL (AS CACO3)	mg/L		NA	NA		--	--	--	7	7		745	11/24/97	UCD1-028
	AMMONIA-NITROGEN	mg/L		NA	NA		--	--	--	6	2		0.52	02/28/97	UCD1-027Z3
	CHEMICAL OXYGEN DEMAND	mg/L		NA	NA		--	--	--	5	2		21.8	05/20/97	UCD1-027Z3
	CHLORIDE	mg/L	250 S	NA	NA		--	--	--	7	7		65	02/13/97	UCD1-025
	NITRATE-N	mg/L	10 #	2	2	**1**	17.2	02/20/97	UCD1-018	34	34	**24**	92.1	02/25/97	UCD1-024
	PHOSPHORUS, TOTAL (AS P)	mg/L		NA	NA		--	--	--	3	3		0.149 B|	02/12/97	UCD1-034
	SULFATE	mg/L	500 #	NA	NA		--	--	--	7	7		72.2	02/13/97	UCD1-025
	TOTAL DISSOLVED SOLIDS	mg/L	500 S	1	1	**1**	584	02/20/97	UCD1-018	34	34	**24**	1550 |Jc	11/18/97	UCD1-010
	TOTAL KJELDAHL NITROGEN	mg/L		NA	NA		--	--	--	6	6		8	05/20/97	UCD1-027Z3
	TOTAL ORGANIC CARBON	mg/L		1	1		1.5	02/20/97	UCD1-018	32	32		7.7	02/28/97	UCD1-027Z3
Semi-Volatile Organics	BIS(2-ETHYLHEXYL)PHTHALATE	ug/L	4	1	0		--	--	--	12	1		0.83 J|	02/13/97	UCD1-025
Pesticides	4,4'-DDD	ug/L		1	0		--	--	--	21	1		0.007 J|	09/02/97	UCD1-004
	ALPHA-CHLORDANE	ug/L		1	0		--	--	--	21	2		0.005 JP|NJu	05/15/97	UCD1-013
	DIELDRIN	ug/L		1	0		--	--	--	21	2		0.03	05/15/97	UCD1-013
	ENDRIN	ug/L	0.2	1	0		--	--	--	21	2		0.011 J|	05/15/97	UCD1-013
	ENDRIN KETONE	ug/L		1	0		--	--	--	21	2		0.005 J|	05/15/97	UCD1-013
	GAMMA-BHC	ug/L	0.2	1	0		--	--	--	21	1		0.004	05/15/97	UCD1-013
	GAMMA-CHLORDANE	ug/L		1	0		--	--	--	21	1		0.004 J|	08/21/97	UCD1-013
Volatile Organics	1,1,2-TRICHLOROETHANE	ug/L	5	1	0		--	--	--	37	4		3.3 |Ji	08/21/97	UCD1-012
	1,1-DICHLOROETHANE	ug/L	5	1	0		--	--	--	37	5	**5**	13 |Ji	08/21/97	UCD1-012
	1,1-DICHLOROETHENE	ug/L	6	1	0		--	--	--	37	5	**5**	18 |Ji	08/21/97	UCD1-012
	1,2-DICHLOROETHANE	ug/L	0.5	1	0		--	--	--	37	4	**4**	6 |Ji	08/21/97	UCD1-012
	1,2-DICHLOROPROPANE	ug/L	5	1	0		--	--	--	37	4		0.8 |Ji	08/21/97	UCD1-012
	BROMODICHLOROMETHANE	ug/L	100 a	1	0		--	--	--	37	4		8.3	02/18/97	UCD1-012
	CHLOROFORM	ug/L	100 #	1	0		--	--	--	37	22	**5**	7900 |Js	08/21/97	UCD1-012
	DIBROMOCHLOROMETHANE	ug/L	100	1	0		--	--	--	37	1		0.6 J|	02/18/97	UCD1-012
	METHYLENE CHLORIDE	ug/L	5	1	0		--	--	--	37	1		0.4 J|	02/18/97	UCD1-012
	TETRACHLOROETHENE	ug/L	5	1	0		--	--	--	37	2		0.4 J|	02/25/97	UCD1-024
	TRANS-1,2-DICHLOROETHENE	ug/L	10	1	0		--	--	--	37	1		0.2 J|	02/18/97	UCD1-012
	TRICHLOROETHENE	ug/L	5	1	0		--	--	--	37	3		0.3 J|	05/15/97	UCD1-013
	XYLENES (TOTAL)	ug/L	1750	1	0		--	--	--	37	1		0.3 J|	05/19/97	UCD1-004
Radionuclides	AMERICIUM-241	pCi/L		NA	NA		--	--	--	10	3		0.039	02/24/97	UCD1-021
	BISMUTH-212	pCi/L		1	0		--	--	--	32	2		46	08/21/97	UCD1-013
	BISMUTH-214	pCi/L		1	0		--	--	--	32	13		144	02/19/97	UCD1-019
	CARBON-14	pCi/L		1	0		--	--	--	26	17		1800	05/15/97	UCD1-013
	LEAD-214	pCi/L		1	0		--	--	--	32	9		176	02/19/97	UCD1-019
	PLUTONIUM-241	pCi/L		NA	NA		--	--	--	10	1		4.7	02/28/97	UCD1-027Z3
	RADIUM-226	pCi/L	5 *	NA	NA		--	--	--	30	9		0.73	08/21/97	UCD1-012
	TRITIUM	pCi/L	20000 *	1	0		--	--	--	35	7		19400	11/18/97	UCD1-013

TABLE 5.3
NUMBER OF DETECTIONS, POSITIVE AND MAXIMUM VALUES IN HSU-2 GROUNDWATER DURING 1997
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

				UPGRADIENT WELLS						DOWNGRADIENT WELLS					
	PARAMETER		MCL	Number of Results	Number of Detections	Number >MCL	Maximum Value	Date of Maximum Value	Location of Maximum	Number of Results	Number of Detections	Number >MCL	Maximum Value	Date of Maximum Value	Location of Maximum
Metals	ANTIMONY	ug/L	6	1	0		--	--	--	39	3		1.5 B|	02/13/97	UCD2-026
	ARSENIC	ug/L	50	1	1		2.9 |Jc	02/19/97	UCD2-017	39	12		6.2	02/13/97	UCD2-026
	BARIUM	ug/L	1000	1	1		128	02/19/97	UCD2-017	39	39		285	05/15/97	UCD2-014
	CALCIUM	ug/L		1	1		35400	02/19/97	UCD2-017	39	39		57800	08/21/97	UCD2-014
	CHROMIUM	ug/L	50	1	1		18.5 |Jn	02/19/97	UCD2-017	39	33	4	62.6 |Jk	05/15/97	UCD2-014
	CHROMIUM, HEXAVALENT (+6)	ug/L		1	1		13	02/19/97	UCD2-017	39	37		61	08/27/97	UCD2-032
	COBALT	ug/L		1	1		1.2 B|	02/19/97	UCD2-017	39	14		3.1 B|	05/20/97	UCD2-014
	COPPER	ug/L	1300 #	1	1		1.5 B|Jn	02/19/97	UCD2-017	39	19		17	11/21/97	UCD4-042
	IRON	ug/L	300 S	1	0		--	--	--	39	5	5	2010	12/01/97	UCD2-036
	LEAD	ug/L	15	1	0		--	--	--	39	5		7.4 |Jn	08/21/97	UCD2-014
	MAGNESIUM	ug/L		1	1		59700	02/19/97	UCD2-017	39	39		148000	08/21/97	UCD2-014
	MANGANESE	ug/L	50 S	1	0		--	--	--	39	16	2	97.6 |Jn	02/27/97	UCD2-027Z4
	MOLYBDENUM	ug/L		1	1		1.9 B|	02/19/97	UCD2-017	39	19		2.4 B|	02/28/97	UCD2-035
	NICKEL	ug/L	100	1	1		5.5 B|Jn	02/19/97	UCD2-017	39	21		48.3	02/27/97	UCD2-027Z4
	POTASSIUM	ug/L		1	0		--	--	--	39	12		40200	11/21/97	UCD4-042
	SELENIUM	ug/L	50	1	1		5.1	02/19/97	UCD2-017	39	17		6.8	02/19/97	UCD2-016
	SODIUM	ug/L		1	1		29500	02/19/97	UCD2-017	39	39		89200	11/21/97	UCD4-042
	VANADIUM	ug/L		1	1		4.4 B|	02/19/97	UCD2-017	39	31		16.1	05/14/97	UCD2-016
	ZINC	ug/L	5000 S	1	1		4.5 B|Jn	02/19/97	UCD2-017	39	15		40.2 |Jn	02/27/97	UCD2-027Z4
General Chemical Parameters	ALKALINITY, TOTAL (AS CACO3)	mg/L		1	1		--	--	--	27	27		473	08/27/97	UCD2-032
	AMMONIA-NITROGEN	mg/L		NA	NA		--	--	--	26	3		0.206	05/20/97	UCD2-027Z4
	CHLORIDE	mg/L	250 S	NA	NA		--	--	--	27	27		29.4	11/25/97	UCD2-040
	NITRATE-N	mg/L	10 #	NA	NA		1.47	02/19/97	UCD2-017	44	44	2	20.3 |Jh	08/21/97	UCD2-014
	PHOSPHORUS, TOTAL (AS P)	mg/L		1	1		--	--	--	6	6		0.151 B|	02/13/97	UCD2-026
	SULFATE	mg/L	500 #	NA	NA		--	--	--	27	27		49.4	08/27/97	UCD2-032
	TOTAL DISSOLVED SOLIDS	mg/L	500 S	NA	NA		391	02/19/97	UCD2-017	42	42	6	868	05/15/97	UCD2-014
	TOTAL KJELDAHL NITROGEN	mg/L		1	1		--	--	--	26	13		7.61	05/22/97	UCD2-027Z7
	TOTAL ORGANIC CARBON	mg/L		NA	NA		0.9 B|	02/19/97	UCD2-017	41	41		6.08	08/27/97	UCD2-032
Semi-Volatile Organics	ANTHRACENE	ug/L		1	0		--	--	--	30	1		2 J|	08/27/97	UCD2-032
	BIS(2-ETHYLHEXYL)PHTHALATE	ug/L	4	1	0		--	--	--	30	12	9	17	11/25/97	UCD2-030
	BUTYLBENZYLPHTHALATE	ug/L	100 #	1	0		--	--	--	30	2		0.71 J|	11/25/97	UCD2-030
	DI-N-BUTYLPHTHALATE	ug/L		1	0		--	--	--	30	2		1.1 J|	11/21/97	UCD2-032
	DI-N-OCTYLPHTHALATE	ug/L		1	0		--	--	--	30	5		4.4 J|	11/25/97	UCD2-040
	PHENOL	ug/L		1	0		--	--	--	30	1		2.5 J|	11/21/97	UCD4-042
	PYRENE	ug/L		1	0		--	--	--	30	1		1 J|	08/27/97	UCD2-032
Pesticides	HEPTACHLOR	ug/L	0.01	1	0		--	--	--	22	1		0.009 J|	05/20/97	UCD2-027Z4
Volatile Organics	1,1,2-TRICHLOROETHANE	ug/L	5	1	0		--	--	--	43	1		0.2 J|	11/24/97	UCD2-029
	1,1-DICHLOROETHANE	ug/L	5	1	0		--	--	--	43	8		1	11/21/97	UCD2-032
	1,1-DICHLOROETHENE	ug/L	6	1	0		--	--	--	43	8		0.9 J|	11/24/97	UCD2-029
	1,2-DICHLOROETHANE	ug/L	0.5	1	0		--	--	--	43	9	6	1.7	11/24/97	UCD2-029
	1,2-DICHLOROPROPANE	ug/L	5	1	0		--	--	--	43	9		1.6	11/24/97	UCD2-029
	1,3-DICHLOROBENZENE	ug/L	600 #	1	0		--	--	--	43	1		1.5	11/25/97	UCD2-040
	BENZENE	ug/L	1	1	0		--	--	--	43	1		0.3 J|	11/21/97	UCD4-042
	BROMODICHLOROMETHANE	ug/L	100 a	1	0		--	--	--	43	1		0.3 J|	02/27/97	UCD2-027Z4
	CHLOROFORM	ug/L	100 #	1	0		--	--	--	43	25	3	140 B|	11/24/97	UCD2-029
	METHYLENE CHLORIDE	ug/L	5	1	0		--	--	--	43	2		0.5 J|	02/27/97	UCD2-027Z4
	TOLUENE	ug/L	1000 #	1	0		--	--	--	43	1		0.4 J|	08/26/97	UCD2-016
	XYLENES (TOTAL)	ug/L	1750	1	0		--	--	--	43	1		0.3 J|	05/13/97	UCD2-035
Radionuclides	AMERICIUM-241	pCi/L		1	1		--	--	--	18	8		0.044	05/22/97	UCD2-027Z7
	BISMUTH-214	pCi/L		NA	NA		144	02/19/97	UCD2-017	41	11		151	02/19/97	UCD2-016
	CARBON-14	pCi/L		1	0		--	--	--	36	7		1090	05/15/97	UCD2-014
	GROSS ALPHA	pCi/L	15 *	1	0		--	--	--	41	3		7.9 C|	02/27/97	UCD2-027Z5
	GROSS BETA	pCi/L	50 *	1	0		--	--	--	41	3		42.8 C|	11/21/97	UCD4-042
	LEAD-214	pCi/L		1	1		180	02/19/97	UCD2-017	41	10		155	02/19/97	UCD2-016
	RADIUM-226	pCi/L	5 *	NA	NA		--	--	--	41	6		0.49	05/21/97	UCD2-027Z4
	THALLIUM-208	pCi/L		NA	NA		--	--	--	41	1		3.6	08/26/97	UCD2-007
	TRITIUM	pCi/L	20000 *	1	0		--	--	--	44	10		9540	05/15/97	UCD2-014

TABLE 5.3
NUMBER OF DETECTIONS, POSITIVE AND MAXIMUM VALUES IN SURFACE WATER DURING 1997
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

					SURFACE WATER LOCATIONS					
	PARAMETER		MCL		Number of Results	Number of Detections	Number >MCL	Maximum Value	Date of Maximum Value	Location of Maximum
Metals	ANTIMONY	ug/L	6		16	1		1.1 B|Jn	02/20/97	PCD
	ARSENIC	ug/L	50		16	6		5.1	02/20/97	STPO
	BARIUM	ug/L	1000		16	16		108	11/12/97	PCD
	CALCIUM	ug/L			16	16		33200	05/27/97	PCU
	CHROMIUM	ug/L	50		16	12		7.9 B|	05/27/97	PCU
	CHROMIUM, HEXAVALENT (+6)	ug/L			16	8		33	05/27/97	PCD
	COBALT	ug/L			16	1		1.2 B|Jn	02/20/97	STPO
	COPPER	ug/L	1300	#	16	12		21.6	11/12/97	PCD
	IRON	ug/L	300	S	16	4		87.8 B|	11/12/97	STPO
	MAGNESIUM	ug/L			16	16		41800	05/27/97	PCU
	MANGANESE	ug/L	50	S	16	10		11.8 |Jn	02/20/97	PCD
	MOLYBDENUM	ug/L			16	5		11.8	08/29/97	STPO
	NICKEL	ug/L	100		16	8		5.8 B|Jn	02/20/97	STPO
	POTASSIUM	ug/L			16	14		12300	11/12/97	STPO
	SELENIUM	ug/L	50		16	6		7	05/27/97	STPO
	SILVER	ug/L	50		16	4		2.9 B|	05/27/97	STPO
	SODIUM	ug/L			16	16		196000	05/27/97	STPO
	VANADIUM	ug/L			16	8		19.3	05/27/97	STPO
	ZINC	ug/L	5000	S	16	9		58.8 |Jn	08/29/97	STPO
General Chemical Parameter	ALKALINITY, TOTAL (AS CACO3)	mg/L			8	8		256 *	08/29/97	STPO
	CHLORIDE	mg/L	250	S	8	8		139 *	08/29/97	STPO
	HARDNESS	mg/L			4	4		255	05/27/97	PCU
	NITRATE-N	mg/L	10	#	16	16		9.55	11/12/97	STPO
	SULFATE	mg/L	500	#	8	8		76 *	08/29/97	STPO
	SURVIVAL BIOASSAY	%			8	8		100	05/27/97	PCU
	TOTAL DISSOLVED SOLIDS	mg/L	500	S	16	16	**5**	700	05/27/97	STPO
	TOTAL ORGANIC CARBON	mg/L			16	16		9.53 N|Jm	11/12/97	STPO
	BIS(2-ETHYLHEXYL)PHTHALATE	ug/L	4		8	2		0.7 J|	02/20/97	STPO
Pesticides	4,4'-DDD	ug/L			11	2		0.027	08/29/97	STPO
	4,4'-DDT	ug/L			11	1		0.039 |Jw	08/29/97	PCU
	ALDRIN	ug/L	0.05	C	12	1		0.003 J|	08/29/97	PCU
	ALPHA-CHLORDANE	ug/L			12	1		0.007 JP|JNu	08/29/97	STPO
	HEPTACHLOR EPOXIDE	ug/L	0.01		12	1		0.003 J|	08/29/97	PCU
Volatile Organics	ACETONE	ug/L			11	7		6.9 |Jc	09/03/97	STPO
	BROMODICHLOROMETHANE	ug/L	100	a	16	9		19	05/27/97	STPO
	BROMOFORM	ug/L	100		16	2		2.9	09/03/97	STPO
	CHLOROFORM	ug/L	100	#	16	10		14	05/27/97	STPO
	DIBROMOCHLOROMETHANE	ug/L	100		16	7		18	05/27/97	STPO
	METHYLENE CHLORIDE	ug/L	5		16	2		1 J|	11/12/97	STPO
Radionuclides	AMERICIUM-241	pCi/L			8	1		0.026	05/27/97	PCD
	BISMUTH-214	pCi/L			11	2		23 |Jf	05/27/97	PCD
	GROSS BETA	pCi/L	50	*	11	4		19.7 C|Jf	02/20/97	STPO
	LEAD-212	pCi/L			11	1		48 |Jf	05/27/97	PCD
	LEAD-214	pCi/L			11	1		10.4	02/20/97	PCU
	RADIUM-226	pCi/L	5	*	11	1		0.19	05/27/97	PCU
	TRITIUM	pCi/L	20000	*	16	2		790	05/27/97	PCD

TABLE 5.3
NUMBER OF DETECTIONS, POSITIVE AND MAXIMUM VALUES IN STORM WATER DURING 1997
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

					STORM WATER LOCATIONS					
	PARAMETER		MCL		Number of Results	Number of Detections	Number >MCL	Maximum Value	Date of Maximum Value	Location of Maximum
Metals	ANTIMONY	ug/L	6		9	5	**2**	29	05/23/97	LS-1
	ARSENIC	ug/L	50		9	6		15.6	12/10/96	LS-1
	BARIUM	ug/L	1000		9	8		293	12/10/96	LS-1
	CALCIUM	ug/L			9	9		20000	05/23/97	LF-3
	CHROMIUM	ug/L	50		9	3	**2**	115	12/10/96	LS-1
	COBALT	ug/L			9	5		25.8	12/10/96	LS-1
	COPPER	ug/L	1300	#	9	7		74	12/10/96	LS-1
	IRON	ug/L	300	S	9	4	**3**	39000	12/10/96	LS-1
	LEAD	ug/L	15		9	5	**1**	23.5	12/10/96	SD-1
	MAGNESIUM	ug/L			9	9		31300	12/10/96	LS-1
	MANGANESE	ug/L	50	S	9	6	**5**	570	12/10/96	LS-1
	MERCURY	ug/L	2		9	4		0.79 *|Jd	12/10/96	LS-1
	MOLYBDENUM	ug/L			9	4		4.9 B|	12/10/96	LS-1
	NICKEL	ug/L	100		9	8	**2**	247	12/10/96	LS-1
	POTASSIUM	ug/L			9	9		61900	12/10/96	LS-1
	SELENIUM	ug/L	50		9	1		4.4	05/23/97	LF-3
	SILVER	ug/L	50		9	2		1	05/23/97	LS-1
	SODIUM	ug/L			9	9		70500	05/23/97	LS-1
	VANADIUM	ug/L			9	3		73.5	12/10/96	LS-1
	ZINC	ug/L	5000	S	9	6		236 N|Jm	12/10/96	SD-1
General Chemical Parameter	ALKALINITY, TOTAL (AS CACO3)	mg/L			7	7		155	05/23/97	LF-3
	AMMONIA-NITROGEN	mg/L			2	2		1.28	05/23/97	LS-1
	CHEMICAL OXYGEN DEMAND	mg/L			2	2		95.6	05/23/97	LS-1
	CHLORIDE	mg/L	250	S	7	7		89.1	05/23/97	LS-1
	HARDNESS	mg/L			3	3		158	05/23/97	LF-3
	NITRATE-N	mg/L	10	#	7	7		2	12/10/96	LS-1
	OIL AND GREASE	mg/L			6	1		1.2	05/23/97	LS-1
	PHOSPHORUS, TOTAL (AS P)	mg/L			2	2		0.591	05/23/97	LS-1
	SULFATE	mg/L	500	#	7	7		18.5	05/23/97	LF-3
	SURVIVAL BIOASSAY	%			3	3		100	05/23/97	LF-3
	TOTAL DISSOLVED SOLIDS	mg/L	500	S	9	9		350	12/10/96	LS-1
	TOTAL KJELDAHL NITROGEN	mg/L			2	2		3.75	05/23/97	LS-1
	TOTAL ORGANIC CARBON	mg/L			7	7		35.9	05/23/97	LS-1
Pesticides	ALPHA-CHLORDANE	ug/L			5	2		0.017 P|J	05/23/97	LS-1
	GAMMA-CHLORDANE	ug/L			5	2		0.013 P|J	05/23/97	LS-1
Semi-Volatile Organics	BIS(2-ETHYLHEXYL)PHTHALATE	ug/L			4	1		1.8 J|	12/10/96	SD-1
Volatile Organics	2-BUTANONE	ug/L			8	2		3.3 J|	05/23/97	LF-3
	ACETONE	ug/L			8	4		11	05/23/97	LS-1
	TOLUENE	ug/L	1000	#	8	1		0.3 J|J	05/23/97	LS-1
	XYLENES (TOTAL)	ug/L	1750		8	1		0.2 J|J	05/23/97	LS-1
Radionuclides	AMERICIUM-241	pCi/L			4	2		0.032	12/10/96	SD-1
	CARBON-14	pCi/L			9	2		64	12/10/96	LS-1
	GROSS ALPHA	pCi/L	15	*	9	1		4.7 C|	12/10/96	SD-1
	GROSS BETA	pCi/L	50	*	9	9	**1**	62.3 C|	12/10/96	LS-1
	RADIUM-226	pCi/L	5	*	9	4	**2**	1.09 |Jf	11/26/97	LF-3

TABLE 5.4
SUMMARY OF CHEMICAL DETECTIONS - GROUNDWATER
METALS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	ANTIMONY ug/L		ARSENIC ug/L		BARIUM ug/L		CALCIUM ug/L	CHROMIUM ug/L		CHROMIUM, HEXAVALENT (+6) ug/L		COBALT ug/L		COPPER ug/L	
UCD1-001	02/24/97		WINTER	--		--		--		--	--		27		--		--	
UCD1-004	02/13/97		WINTER	9.3		4.2		211		39900	23.3	J|	17		1.6	B|	2.6	B|J|n
UCD1-004	05/19/97		SPRING	--		--		--		--	--		19		--		--	
UCD1-004	09/02/97		SUMMER	--		--		--		--	--		19		--		--	
UCD1-004	11/17/97		FALL	--		--		--		--	--		18		--		--	
UCD1-010	02/18/97		WINTER	2.1	B|	4.2		40.3		51900	77.8	J|	71		3.5	B|	2.7	B|J|n
UCD1-010	08/25/97		SUMMER	--		--		--		--	--		72		--		--	
UCD1-010	11/18/97		FALL	--		--		--		--	--		65	H|J|h	--		--	
UCD1-011	02/18/97		WINTER	<		3.8		311		52000	229	J|	252		2.2	B|	2.0	B|J|n
UCD1-011	08/25/97		SUMMER	--		--		--		--	--		253		--		--	
UCD1-012	02/18/97		WINTER	<		8.1		437		71300	176	J|	175		4.4	B|	2.6	B|J|n
UCD1-012	05/15/97		SPRING	--		--		--		--	--		148		--		--	
UCD1-012	08/21/97		SUMMER	--		--		--		--	--		182	H|J|h	--		--	
UCD1-012	08/21/97	D	SUMMER	--		--		--		--	--		184	H|J|h	--		--	
UCD1-012	11/17/97		FALL	--		--		--		--	--		165		--		--	
UCD1-013	02/18/97		WINTER	1.4	B|	6.1		331		74400	80.6	J|	76		3.5	B|	2.0	B|J|n
UCD1-013	05/15/97		SPRING	--		--		--		--	--		76		--		--	
UCD1-013	08/21/97		SUMMER	--		--		--		--	--		85	H|J|h	--		--	
UCD1-013	11/18/97		FALL	--		--		--		--	--		79	H|J|h	--		--	
UCD1-018	02/20/97		WINTER	<		4.0		172		38600	21.8	J|	18		1.8	B|J|n	1.7	B|J|n
UCD1-018	08/27/97		SUMMER	--		--		--		--	--		16		--		--	
UCD1-019	02/19/97		WINTER	1.2	B|	9.3		94.4		60300	173	J|	184		3.1	B|	2.3	B|J|n
UCD1-019	05/14/97		SPRING	--		--		--		--	--		7	B|	--		--	
UCD1-020	02/24/97		WINTER	2.6	B|J|n	4.2		100		23900	30.1	J|	30		1.0	B|J|n	1.3	B|J|n
UCD1-020	08/26/97		SUMMER	--		--		--		--	--		29		--		--	
UCD1-021	02/24/97		WINTER	2.5	J|n	4.9		141		51200	57.6	J|	58		2.2	B|J|n	1.8	B|J|n
UCD1-021	02/24/97	D	WINTER	2.0	B|J|n	4.1		147		52800	63.3	J|	60		2.4	B|J|n	1.9	B|J|n
UCD1-023	02/13/97		WINTER	2.4	B|	3.9		141		39100	27.3	J|	21		2.7	B|	2.1	B|J|n
UCD1-024	02/25/97		WINTER	1.1	B|J|n	2.9		267		58100	34.8	J|	32		2.6	B|J|n	2.3	B|J|n
UCD1-025	02/13/97		WINTER	<		4.0		305		44400	355	J|	17		2.5	B|	2.4	B|J|n
UCD1-025	05/19/97		SPRING	<		5.1	J|k	285		42100	347	J|k	338		<		<	
UCD1-025	08/26/97		SUMMER	--		--		--		--	--		314		--		--	
UCD1-025	11/18/97		FALL	--		--		--		--	--		331	H|J|h	--		--	
UCD1-027Z3	02/28/97		WINTER	2.5	B|J|n	3.3		163.		41000	5.1	B|J|n	3	B|	1.7	B|J|n	1.6	B|J|n
UCD1-027Z3	05/20/97		SPRING	<		<		152		38500	1.1	B|	14		3.8	B|	<	
UCD1-028	11/24/97		FALL	<		<		202		51000	577		529		<		13.7	
UCD1-034	02/12/97		WINTER	<		3.3		155		35600	7.3	B|J|n	--		1.7	B|	2.6	B|J|n
UCD1-034	05/19/97		SPRING	<		<		96.9		38700	<		60		<		6.1	B|
UCD2-007	02/24/97		WINTER	<		4.1		148		33200	37.3	J|	42		1.2	B|J|n	1.5	B|J|n
UCD2-007	08/26/97		SUMMER	--		--		--		--	--		21		--		--	
UCD2-014	02/18/97		WINTER	<		3.4		258		55000	51.2	J|	45		3.1	B|	2.0	B|J|n
UCD2-014	02/18/97	D	WINTER	<		4.9		264		56000	53.8	J|	47		3.1	B|	2.3	B|J|n
UCD2-014	05/15/97		SPRING	<		<		285		55700	62.6	J|k	42		1.1	B|	<	
UCD2-014	08/21/97		SUMMER	<		<		235	E|J|n	57800	46.2		35	H|J|h	<		3.8	B|
UCD2-014	11/19/97		FALL	<		<		241		52300	46.6		47		<		<	
UCD2-015	02/13/97		WINTER	1.2	B|	3.3		136		33100	14.7	J|	8	B|	1.5	B|	1.8	B|J|n
UCD2-015	05/19/97		SPRING	--		--		--		--	--		6	B|	--		--	

TABLE 5.4
SUMMARY OF CHEMICAL DETECTIONS - GROUNDWATER
METALS
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LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	ANTIMONY ug/L	ARSENIC ug/L	BARIUM ug/L	CALCIUM ug/L	CHROMIUM ug/L	CHROMIUM, HEXAVALENT (+6) ug/L	COBALT ug/L	COPPER ug/L
UCD2-015	09/02/97		SUMMER	<	<	122 E|Jn	36900	<	7 B|	<	<
UCD2-015	11/17/97		FALL	--	--	--	--	--	9 B|	--	--
UCD2-015	11/17/97	D	FALL	--	--	--	--	--	12	--	--
UCD2-016	02/19/97		WINTER	<	6.2 |Jc	149	38600	34.8 |Jn	30	2.4 B|	1.6 B|Jn
UCD2-016	05/14/97		SPRING	<	<	175	43500	45.2 |Jk	34	1.5 B|	<
UCD2-016	08/26/97		SUMMER	<	<	138 E|Jn	39500	32.7	35	<	<
UCD2-016	11/17/97		FALL	<	<	152	37800	31.4	37	<	<
UCD2-017	02/19/97		WINTER	<	2.9 |Jc	128	35400	18.5 |Jn	13	1.2 B|	1.5 B|Jn
UCD2-017	08/27/97		SUMMER	--	--	--	--	--	9 B|	--	--
UCD2-026	02/13/97		WINTER	1.5 B|	6.2	95.9	36500	18.3 |Jn	14	1.3 B|	1.8 B|Jn
UCD2-026	05/19/97		SPRING	<	<	150	38700	41.6 |Jk	31	<	1.7 B|
UCD2-026	05/19/97	D	SPRING	<	6 |Jk	144	37300	40.3 |Jk	30	<	<
UCD2-026	08/26/97		SUMMER	--	--	--	--	--	21	--	--
UCD2-026	11/18/97		FALL	--	--	--	--	--	24 H|Jh	--	--
UCD2-027Z4	02/27/97		WINTER	<	3.4	136	38600	6.9 B|Jn	3 B|	1.6 B|Jn	1.8 B|Jn
UCD2-027Z4	05/21/97		SPRING	1.3 |B	<	160	41200	25.4	16	1.2 B|	<
UCD2-027Z5	02/27/97		WINTER	<	2.6	142	36700	14.2 |Jn	12	1.2 B|Jn	1.6 B|Jn
UCD2-027Z5	05/21/97		SPRING	<	<	154	39900	16.5	14	<	1.2 B|
UCD2-027Z6	02/26/97		WINTER	<	2.7	138	36100	15.6 |Jn	14	1.0 B|Jn	2.0 B|Jn
UCD2-027Z6	05/21/97		SPRING	<	<	146	38300	10.8	9 B|	<	1.2 B|
UCD2-027Z7	02/26/97		WINTER	<	3.6	150	35300	11.9 |Jn	8 B|	1.2 B|Jn	1.8 B|Jn
UCD2-027Z7	05/22/97		SPRING	<	<	175	38200	9.3 B|	8 B|	<	1.2 B|
UCD2-029	11/24/97		FALL	<	<	181	44500	16.1	10	<	<
UCD2-029	11/24/97	D	FALL	<	<	177	43700	18.2	9 B|	<	<
UCD2-030	11/25/97		FALL	<	<	166	42100	11.4	--	<	<
UCD2-031	11/25/97		FALL	<	<	150	38400	15.5	--	<	<
UCD2-032	08/27/97		SUMMER	<	<	166 E|Jn	43100	54.4	61	<	<
UCD2-032	11/21/97		FALL	<	<	179	43700	20.2	--	<	<
UCD2-035	02/12/97		WINTER	<	4.8	133	36300	11.4 |Jn	3 B|	1.8 B|	1.9 B|Jn
UCD2-035	05/13/97		SPRING	<	<	150	36800	<	<	<	1.4 B|
UCD2-036	12/01/97		FALL	<	<	91.8	35800	<	20	<	<
UCD2-037	12/01/97		FALL	<	<	119	33300	<	5 B|	<	<
UCD2-038	11/25/97		FALL	<	<	114	34400	<	--	<	<
UCD2-039	12/01/97		FALL	<	<	131	35600	<	5 B|	<	<
UCD2-040	11/25/97		FALL	<	<	160	44500	22.6	--	<	<
UCD4-041	11/24/97		FALL	<	<	90.3	33900	20.2	14	<	<
UCD4-042	11/21/97		FALL	<	<	90.0	27600	21.7	--	<	17.0
UCD4-043	11/21/97		FALL	<	<	130	36100	26.7	--	<	17.0

TABLE 5.4
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Location	Date	QA	Analyte / Units / Quarter	IRON ug/L	LEAD ug/L	MAGNESIUM ug/L	MANGANESE ug/L	MOLYBDENUM ug/L	NICKEL ug/L	POTASSIUM ug/L	SELENIUM ug/L
UCD1-001	02/24/97		WINTER	--	--	--	--	--	--	--	--
UCD1-004	02/13/97		WINTER	<	<	71400	<	1.3 B|	7.7 B|Jn	<	<
UCD1-004	05/19/97		SPRING	--	--	--	--	--	--	--	--
UCD1-004	09/02/97		SUMMER	--	--	--	--	--	--	--	--
UCD1-004	11/17/97		FALL	--	--	--	--	--	--	--	--
UCD1-010	02/18/97		WINTER	<	<	198000	1.2 B|	1.0 B|	7.9 B|Jn	<	30.2
UCD1-010	08/25/97		SUMMER	--	--	--	--	--	--	--	--
UCD1-010	11/18/97		FALL	--	--	--	--	--	--	--	--
UCD1-011	02/18/97		WINTER	<	<	135000	<	1.1 B|	6.6 B|Jn	<	15.5
UCD1-011	08/25/97		SUMMER	--	--	--	--	--	--	--	--
UCD1-012	02/18/97		WINTER	<	<	215000	1.1 B|	<	11.0 B|Jn	<	21.6
UCD1-012	05/15/97		SPRING	--	--	--	--	--	--	--	--
UCD1-012	08/21/97		SUMMER	--	--	--	--	--	--	--	--
UCD1-012	08/21/97	D	SUMMER	--	--	--	--	--	--	--	--
UCD1-012	11/17/97		FALL	--	--	--	--	--	--	--	--
UCD1-013	02/18/97		WINTER	<	<	190000	<	<	9.4 B|Jn	<	6.9
UCD1-013	05/15/97		SPRING	--	--	--	--	--	--	--	--
UCD1-013	08/21/97		SUMMER	--	--	--	--	--	--	--	--
UCD1-013	11/18/97		FALL	--	--	--	--	--	--	--	--
UCD1-018	02/20/97		WINTER	<	<	100000	<	1.4 B|	10.7 B|Jn	<	5.6
UCD1-018	08/27/97		SUMMER	--	--	--	--	--	--	--	--
UCD1-019	02/19/97		WINTER	<	<	167000	1.1 B|	1.5 B|	7.9 B|Jn	<	13.9
UCD1-019	05/14/97		SPRING	--	--	--	--	--	--	--	--
UCD1-020	02/24/97		WINTER	<	<	58300	<	1.8 B|	4.1 B|Jn	<	4.6
UCD1-020	08/26/97		SUMMER	--	--	--	--	--	--	--	--
UCD1-021	02/24/97		WINTER	<	<	129000	<	1.3 B|	7.9 B|Jn	<	8.0
UCD1-021	02/24/97	D	WINTER	<	<	132000	<	1.4 B|	8.8 B|Jn	<	7.9
UCD1-023	02/13/97		WINTER	<	<	93000	11.4	1.4 B|	114 |Jn	<	4.3
UCD1-024	02/25/97		WINTER	<	<	148000	<	1.3 B|	8.7 B|Jn	<	7.3
UCD1-025	02/13/97		WINTER	<	<	135000	1.9 B|	<	6.8 B|Jn	<	9.5
UCD1-025	05/19/97		SPRING	<	2.4	120000	1.3 B|	<	9.8 B|	852. B|	5.8
UCD1-025	08/26/97		SUMMER	--	--	--	--	--	--	--	--
UCD1-025	11/18/97		FALL	--	--	--	--	--	--	--	--
UCD1-027Z3	02/28/97		WINTER	1130	<	83400	1230 |Jn	9.1 B|	30.4 |Jn	1650 B|	3.1
UCD1-027Z3	05/20/97		SPRING	1570 E|Jn	<	79400	1310	7.1 B|	218	924. B|	4.8
UCD1-028	11/24/97		FALL	<	<	169000	<	<	9.0 B|	917 B|	8.0
UCD1-034	02/12/97		WINTER	<	<	54800	27.1	1.5 B|	6.9 B|Jn	<	<
UCD1-034	05/19/97		SPRING	<	3.7	55400	27.2	<	6.8 B|	<	<
UCD2-007	02/24/97		WINTER	<	<	68700	<	2.0 B|	5.6 B|Jn	<	3.1
UCD2-007	08/26/97		SUMMER	--	--	--	--	--	--	--	--
UCD2-014	02/18/97		WINTER	<	<	140000	1.2 B|	1.2 B|	9.0 |Jn	<	6.3
UCD2-014	02/18/97	D	WINTER	<	<	144000	1.1 B|	1.2 B|	9.3 B|Jn	<	4.5
UCD2-014	05/15/97		SPRING	<	1.2 B|	138000	<	<	<	<	3.2
UCD2-014	08/21/97		SUMMER	605.	7.4 |Jn	148000	<	<	<	<	<
UCD2-014	11/19/97		FALL	<	<	132000	<	<	<	899 B|	<
UCD2-015	02/13/97		WINTER	<	<	58900	<	1.9 B|	6.7 B|Jn	<	3.7
UCD2-015	05/19/97		SPRING	--	--	--	--	--	--	--	--

TABLE 5.4
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Location	Date	QA	Analyte / Units / Quarter	IRON ug/L	LEAD ug/L	MAGNESIUM ug/L	MANGANESE ug/L	MOLYBDENUM ug/L	NICKEL ug/L	POTASSIUM ug/L	SELENIUM ug/L
UCD2-015	09/02/97		SUMMER	<	<	62400	<	<	<	<	<
UCD2-015	11/17/97		FALL	--	--	--	--	--	--	--	--
UCD2-015	11/17/97	D	FALL	--	--	--	--	--	--	--	--
UCD2-016	02/19/97		WINTER	<	<	67600	<	1.6 B|	5.4 B|Jn	<	6.8
UCD2-016	05/14/97		SPRING	<	1.4 B|	72700	<	1.4 B|	<	1020 B|	4.8 B|
UCD2-016	08/26/97		SUMMER	<	7.3 |Jn	68900	<	<	<	<	<
UCD2-016	11/17/97		FALL	<	<	64600	<	<	<	<	<
UCD2-017	02/19/97		WINTER	<	<	59700	<	1.9 B|	5.5 B|Jn	<	5.1
UCD2-017	08/27/97		SUMMER	--	--	--	--	--	--	--	--
UCD2-026	02/13/97		WINTER	<	<	63400	1.9 B|	1.8 B|	10.7 B|Jn	<	4.4
UCD2-026	05/19/97		SPRING	<	1.8 B|	68100	<	1.7 B|	10.6 B|	992. B|	3.9
UCD2-026	05/19/97	D	SPRING	<	<	65400	1.1 B|	1.7 B|	10.2 B|	861. B|	<
UCD2-026	08/26/97		SUMMER	--	--	--	--	--	--	--	--
UCD2-026	11/18/97		FALL	--	--	--	--	--	--	--	--
UCD2-027Z4	02/27/97		WINTER	<	<	69400	97.6 |Jn	2.1 B|	<	<	4.2
UCD2-027Z4	05/21/97		SPRING	<	<	74000	27.2	2.2 B|	48.3	<	6.1
UCD2-027Z5	02/27/97		WINTER	<	<	61500	1.5 B|Jn	1.8 B|	7.3 B|Jn	<	<
UCD2-027Z5	05/21/97		SPRING	<	<	66900	1.9 B|	1.8 B|	10.5 B|	<	4.6
UCD2-027Z6	02/26/97		WINTER	<	<	58400	1.9 B|Jn	1.6 B|	6.1 B|Jn	<	4.1
UCD2-027Z6	05/21/97		SPRING	<	<	61900	2.3 B|	1.4 B|	2.1 B|	<	4.2
UCD2-027Z7	02/26/97		WINTER	<	<	56100	44.1 |Jn	1.6 B|	7.1 B|Jn	<	4.0
UCD2-027Z7	05/22/97		SPRING	<	<	61200	18.5	1.7 B|	7.2 B|	<	6.4
UCD2-029	11/24/97		FALL	<	<	75400	<	<	13.2 B|Jf	<	<
UCD2-029	11/24/97	D	FALL	<	<	73300	<	<	24.1 |Jf	<	<
UCD2-030	11/25/97		FALL	<	<	68400	<	<	<	<	<
UCD2-031	11/25/97		FALL	<	<	61100	<	<	<	<	<
UCD2-032	08/27/97		SUMMER	484.	<	73100	<	<	<	<	4.2
UCD2-032	11/21/97		FALL	<	<	72100	<	<	11.0 B|	<	<
UCD2-035	02/12/97		WINTER	39.2 B|	<	61100	9.6 B|	2.4 B|	11.5 B|Jn	<	<
UCD2-035	05/13/97		SPRING	80.2 B|	<	56400	7.3 B|	2.4 B|	7.8	852. B|	<
UCD2-036	12/01/97		FALL	2010	<	62700	66.9	<	<	1140	<
UCD2-037	12/01/97		FALL	<	<	55900	<	<	<	1080 B|	<
UCD2-038	11/25/97		FALL	<	<	65300	<	<	<	1090 B|	<
UCD2-039	12/01/97		FALL	<	<	63200	7.4 B|	<	<	987 B|	<
UCD2-040	11/25/97		FALL	<	<	74400	<	<	<	<	<
UCD4-041	11/24/97		FALL	<	<	52400	<	<	<	1910 B|	<
UCD4-042	11/21/97		FALL	<	<	49300	<	<	10.3 B|	40200	<
UCD4-043	11/21/97		FALL	<	<	60700	<	<	<	1370 B|	<

TABLE 5.4
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METALS
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Location	Date	QA	Analyte / Units / Quarter	SODIUM ug/L		VANADIUM ug/L		ZINC ug/L	
UCD1-001	02/24/97		WINTER	--		--		--	
UCD1-004	02/13/97		WINTER	32100		6.3	B|	7.4	B|Jn
UCD1-004	05/19/97		SPRING	--		--		--	
UCD1-004	09/02/97		SUMMER	--		--		--	
UCD1-004	11/17/97		FALL	--		--		--	
UCD1-010	02/18/97		WINTER	182000		6.8	B|	6.9	B|Jn
UCD1-010	08/25/97		SUMMER	--		--		--	
UCD1-010	11/18/97		FALL	--		--		--	
UCD1-011	02/18/97		WINTER	80700		6.2	B|	5.1	B|Jn
UCD1-011	08/25/97		SUMMER	--		--		--	
UCD1-012	02/18/97		WINTER	91000		8.9	B|	5.3	B|Jn
UCD1-012	05/15/97		SPRING	--		--		--	
UCD1-012	08/21/97		SUMMER	--		--		--	
UCD1-012	08/21/97	D	SUMMER	--		--		--	
UCD1-012	11/17/97		FALL	--		--		--	
UCD1-013	02/18/97		WINTER	57900		8.2	B|	2.9	B|Jn
UCD1-013	05/15/97		SPRING	--		--		--	
UCD1-013	08/21/97		SUMMER	--		--		--	
UCD1-013	11/18/97		FALL	--		--		--	
UCD1-018	02/20/97		WINTER	34800		5.6	B|	4.2	B|Jn
UCD1-018	08/27/97		SUMMER	--		--		--	
UCD1-019	02/19/97		WINTER	70300		4.9	B|	8.8	B|Jn
UCD1-019	05/14/97		SPRING	--		--		--	
UCD1-020	02/24/97		WINTER	32600		12.5		5.8	B|Jn
UCD1-020	08/26/97		SUMMER	--		--		--	
UCD1-021	02/24/97		WINTER	93300		3.8	B|	4.5	B|Jn
UCD1-021	02/24/97	D	WINTER	95400		7.1	B|	5.3	B|Jn
UCD1-023	02/13/97		WINTER	37800		<		3.2	B|Jn
UCD1-024	02/25/97		WINTER	72200		5.2	B|	5.1	B|Jn
UCD1-025	02/13/97		WINTER	76000		3.1	B|	10.3	B|Jn
UCD1-025	05/19/97		SPRING	72300		<		32.9	
UCD1-025	08/26/97		SUMMER	--		--		--	
UCD1-025	11/18/97		FALL	--		--		--	
UCD1-027Z3	02/28/97		WINTER	82400		<		20.9	|Jn
UCD1-027Z3	05/20/97		SPRING	88600		<		19.2	B|
UCD1-028	11/24/97		FALL	112000		7.0	B|	<	
UCD1-034	02/12/97		WINTER	54400		<		14.5	B|Jn
UCD1-034	05/19/97		SPRING	51200		16.1		27.1	
UCD2-007	02/24/97		WINTER	42100		4.9	B|	5.4	B|Jn
UCD2-007	08/26/97		SUMMER	--		--		--	
UCD2-014	02/18/97		WINTER	44100		6.0	B|	5.0	B|Jn
UCD2-014	02/18/97	D	WINTER	45000		6.7	B|	7.5	B|Jn
UCD2-014	05/15/97		SPRING	43800		11.2		<	
UCD2-014	08/21/97		SUMMER	47300		5.7	B|	<	
UCD2-014	11/19/97		FALL	46300		<		<	
UCD2-015	02/13/97		WINTER	27800		<		2.7	B|Jn
UCD2-015	05/19/97		SPRING	--		--		--	

TABLE 5.4
SUMMARY OF CHEMICAL DETECTIONS - GROUNDWATER
METALS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	SODIUM ug/L		VANADIUM ug/L		ZINC ug/L	
UCD2-015	09/02/97		SUMMER	**29500**		**7.3**	B|	<	
UCD2-015	11/17/97		FALL	--		--		--	
UCD2-015	11/17/97	D	FALL	--		--		--	
UCD2-016	02/19/97		WINTER	**49900**		**4.8**	B|	**4.5**	B|Jn
UCD2-016	05/14/97		SPRING	**54300**		**16.1**		<	
UCD2-016	08/26/97		SUMMER	**50400**		**6.9**	B|	<	
UCD2-016	11/17/97		FALL	**45500**		**4.6**	B|	<	
UCD2-017	02/19/97		WINTER	**29500**		**4.4**	B|	**4.5**	B|Jn
UCD2-017	08/27/97		SUMMER	--		--		--	
UCD2-026	02/13/97		WINTER	**33300**		<		**12.2**	B|Jn
UCD2-026	05/19/97		SPRING	**41500**		**14.2**		<	
UCD2-026	05/19/97	D	SPRING	**40600**		**12.5**		<	
UCD2-026	08/26/97		SUMMER	--		--		--	
UCD2-026	11/18/97		FALL	--		--		--	
UCD2-027Z4	02/27/97		WINTER	**37800**		**3.7**	B|	**40.2**	|Jn
UCD2-027Z4	05/21/97		SPRING	**41100**		**5.7**	|B	**28.2**	
UCD2-027Z5	02/27/97		WINTER	**31200**		<		**12.4**	B|Jn
UCD2-027Z5	05/21/97		SPRING	**36300**		**9.5**	B|	**11.1**	B|
UCD2-027Z6	02/26/97		WINTER	**32700**		**6.9**	B|	**11.5**	B|Jn
UCD2-027Z6	05/21/97		SPRING	**36700**		**12.5**		**15**	B|
UCD2-027Z7	02/26/97		WINTER	**36300**		**6.0**	B|	**16.4**	B|Jn
UCD2-027Z7	05/22/97		SPRING	**40500**		**12.2**		**27.0**	
UCD2-029	11/24/97		FALL	**38300**		**4.6**	B|	<	
UCD2-029	11/24/97	D	FALL	**37400**		<		<	
UCD2-030	11/25/97		FALL	**36100**		**5.6**	B|	<	
UCD2-031	11/25/97		FALL	**36800**		**4.6**	B|	<	
UCD2-032	08/27/97		SUMMER	**62900**		**6.9**	B|	<	
UCD2-032	11/21/97		FALL	**41900**		**4.6**	B|	<	
UCD2-035	02/12/97		WINTER	**34500**		**4.3**	B|	**11.2**	B|Jn
UCD2-035	05/13/97		SPRING	**32800**		**14.9**		<	
UCD2-036	12/01/97		FALL	**36900**		<		<	
UCD2-037	12/01/97		FALL	**27900**		**9.2**		<	
UCD2-038	11/25/97		FALL	**31900**		**4.6**	B|	<	
UCD2-039	12/01/97		FALL	**32900**		<		<	
UCD2-040	11/25/97		FALL	**39300**		**6.0**	B|	<	
UCD4-041	11/24/97		FALL	**51900**		**6.1**	B|	<	
UCD4-042	11/21/97		FALL	**89200**		<		<	
UCD4-043	11/21/97		FALL	**49600**		**4.1**	B|	<	

TABLE 5.4
SUMMARY OF CHEMICAL DETECTIONS - GROUNDWATER
GENERAL CHEMICALS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	ALKALINITY, TOTAL (AS CACO3) mg/L	AMMONIA-NITROGEN mg/L	CHEMICAL OXYGEN DEMAND mg/L	CHLORIDE mg/L	NITRATE-N mg/L	PHOSPHORUS, TOTAL (AS P) mg/L	SULFATE mg/L	TOTAL DISSOLVED SOLIDS mg/L
UCD1-001	02/24/97		WINTER	--	--	--	--	12.8	--	--	66.0
UCD1-004	02/13/97		WINTER	--	--	--	--	2.02	--	--	447.
UCD1-004	05/19/97		SPRING	--	--	--	--	3.89	--	--	489.
UCD1-004	09/02/97		SUMMER	--	--	--	--	3.5	--	--	453.
UCD1-004	11/17/97		FALL	--	--	--	--	3.19	--	--	440. |Jc
UCD1-010	02/18/97		WINTER	--	--	--	--	42.2	--	--	1360
UCD1-010	05/14/97		SPRING	--	--	--	--	44.8	--	--	1360
UCD1-010	08/25/97		SUMMER	--	--	--	--	47.3	--	--	1490
UCD1-010	11/18/97		FALL	--	--	--	--	47.3	--	--	1550 |Jc
UCD1-011	02/18/97		WINTER	--	--	--	--	28.8	--	--	77.0
UCD1-011	08/25/97		SUMMER	--	--	--	--	24.6	--	--	--
UCD1-012	02/18/97		WINTER	--	--	--	--	50.7	--	--	1320
UCD1-012	05/15/97		SPRING	--	--	--	--	56.3	--	--	1420
UCD1-012	08/21/97		SUMMER	--	--	--	--	59.1	--	--	1370
UCD1-012	08/21/97	D	SUMMER	--	--	--	--	58.7	--	--	1390
UCD1-012	11/17/97		FALL	--	--	--	--	59	--	--	1370 |Jc
UCD1-013	02/18/97		WINTER	--	--	--	--	17.2	--	--	1040
UCD1-013	05/15/97		SPRING	--	--	--	--	--	--	--	1030
UCD1-013	08/21/97		SUMMER	--	--	--	--	17.4	--	--	1020
UCD1-013	11/18/97		FALL	--	--	--	--	--	--	--	1040 |Jc
UCD1-018	02/20/97		WINTER	--	--	--	--	17.2	--	--	584.
UCD1-018	08/27/97		SUMMER	--	--	--	--	13.5	--	--	--
UCD1-019	02/19/97		WINTER	--	--	--	--	19.7	--	--	944.
UCD1-020	02/24/97		WINTER	--	--	--	--	6.53	--	--	359.
UCD1-021	02/24/97		WINTER	--	--	--	--	58.1	--	--	1020
UCD1-021	02/24/97	D	WINTER	--	--	--	--	58	--	--	987.
UCD1-022	02/25/97		WINTER	--	--	--	--	--	--	--	460.
UCD1-022	08/20/97		SUMMER	--	--	--	--	--	--	--	726.
UCD1-023	02/13/97		WINTER	--	--	--	--	--	--	--	556.
UCD1-024	02/25/97		WINTER	--	--	--	--	92.1	--	--	1060
UCD1-024	11/19/97		FALL	--	--	--	--	85.9	--	--	--
UCD1-025	02/13/97		WINTER	671.	<	<	65	11.6	0.096 B|	72.2	813.
UCD1-025	05/19/97		SPRING	630.	<	<	25.2	12.9	--	37.4	740.
UCD1-025	08/26/97		SUMMER	--	--	--	--	12	--	--	--
UCD1-025	11/18/97		FALL	--	--	--	--	12.7	--	--	--
UCD1-027Z3	02/28/97		WINTER	477.	0.52	18.9 B|	23.7	1.9	0.042 B|	40.1	535.
UCD1-027Z3	05/20/97		SPRING	557.	0.32	21.8 B|	27.4	4	--	37.8	619.
UCD1-028	11/24/97		FALL	745.	<	--	46.2	44.5	--	38.1	1010 |Jc
UCD1-034	02/12/97		WINTER	356.	<	<	23.6	0.491	0.149 B|	30.4	412.
UCD1-034	05/19/97		SPRING	389.	--	--	17.5	0.953	--	23.8	406.
UCD1-034	08/25/97		SUMMER	--	--	--	--	0.081 B|	--	--	--
UCD2-007	02/24/97		WINTER	--	--	--	--	8.28	--	--	469.
UCD2-007	08/26/97		SUMMER	--	--	--	--	6.76	--	--	--
UCD2-014	02/18/97		WINTER	--	--	--	--	7.09	--	--	767.
UCD2-014	02/18/97	D	WINTER	--	--	--	--	7.05	--	--	792.
UCD2-014	05/15/97		SPRING	--	--	--	--	9.31	--	--	868.

TABLE 5.4
SUMMARY OF CHEMICAL DETECTIONS - GROUNDWATER
GENERAL CHEMICALS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	ALKALINITY, TOTAL (AS CACO3) mg/L	AMMONIA-NITROGEN mg/L	CHEMICAL OXYGEN DEMAND mg/L	CHLORIDE mg/L	NITRATE-N mg/L	PHOSPHORUS, TOTAL (AS P) mg/L	SULFATE mg/L	TOTAL DISSOLVED SOLIDS mg/L
UCD2-014	08/21/97		SUMMER	--	--	--	--	20.3 |Jh	--	--	565.
UCD2-014	11/19/97		FALL	--	--	--	--	6.09	--	--	728. |Jc
UCD2-015	02/13/97		WINTER	--	--	--	--	2.03	--	--	378.
UCD2-015	05/19/97		SPRING	--	--	--	--	1.34	--	--	358.
UCD2-015	09/02/97		SUMMER	--	--	--	--	1.44	--	--	381.
UCD2-015	11/17/97		FALL	--	--	--	--	1.52	--	--	384. |Jc
UCD2-015	11/17/97	D	FALL	--	--	--	--	1.51	--	--	379. |Jc
UCD2-016	02/19/97		WINTER	--	--	--	--	4.52	--	--	355.
UCD2-016	05/14/97		SPRING	--	--	--	--	--	--	--	493.
UCD2-016	08/26/97		SUMMER	--	--	--	--	5.67	--	--	479.
UCD2-016	11/17/97		FALL	--	--	--	--	--	--	--	461. |Jc
UCD2-017	02/19/97		WINTER	--	--	--	--	1.47	--	--	391.
UCD2-017	08/27/97		SUMMER	--	--	--	--	1.51	--	--	--
UCD2-026	02/13/97		WINTER	320.	<	<	19.4	1.51	0.151 B|	34.6	421.
UCD2-026	05/19/97		SPRING	362.	<	<	23.6	5.91	--	36.1	442.
UCD2-026	05/19/97	D	SPRING	384.	<	<	23.9	5.96	--	36.4	456.
UCD2-026	08/26/97		SUMMER	--	--	--	--	4.31	--	--	--
UCD2-026	11/18/97		FALL	--	--	--	--	3.87	--	--	--
UCD2-027Z4	02/27/97		WINTER	349.	<	<	24.5	3.95	0.06 B|	39.7	445.
UCD2-027Z4	05/20/97		SPRING	379.	0.206	<	22.8	4.95	--	37.3	465.
UCD2-027Z4	05/21/97		SPRING	--	--	--	--	--	--	--	--
UCD2-027Z5	02/27/97		WINTER	318.	<	<	22.4	3.04	0.096 B|	36.8	389.
UCD2-027Z5	05/21/97		SPRING	346.	0.067	<	23.9	4.64	--	37	424.
UCD2-027Z6	02/26/97		WINTER	319.	<	<	18.9	2.77	0.098 B|	35	398.
UCD2-027Z6	05/21/97		SPRING	340.	<	<	20.1	2.56	--	35.1	398.
UCD2-027Z7	02/26/97		WINTER	325.	<	<	17.7	2.22	0.101 B|	34	379.
UCD2-027Z7	05/22/97		SPRING	335.	<	<	19.9	2.42	--	35.4	421.
UCD2-029	11/24/97		FALL	348.	<	--	26	8.26	--	40.8	470. |Jc
UCD2-029	11/24/97	D	FALL	342.	<	--	26.3	8.17	--	41	466. |Jc
UCD2-030	11/25/97		FALL	339.	<	--	24.3	4.80 |Jc	--	38.2	401. |Jc
UCD2-031	11/25/97		FALL	328.	<	--	20.6	3.26 |Jc	--	35.3	385. |Jc
UCD2-032	08/27/97		SUMMER	473.	--	--	22.5	11.5	--	49.4	603.
UCD2-032	11/21/97		FALL	345.	<	--	25.6	7.41 H|Jh	--	42.6	474. |Jc
UCD2-035	02/12/97		WINTER	303.	<	<	27.1	0.758	0.119 B|	35.8	395.
UCD2-035	05/13/97		SPRING	324.	<	<	25.8	0.858	--	35.9	387.
UCD2-035	08/25/97		SUMMER	--	--	--	--	0.823	--	--	--
UCD2-036	12/01/97		FALL	355.	<	--	18.5	4.2	--	39.1	450. |Jc
UCD2-037	12/01/97		FALL	311.	<	--	18.6	1.96	--	36.5	400. |Jc
UCD2-038	11/25/97		FALL	329.	<	--	18.7	1.94 |Jc	--	33.3	374. |Jc
UCD2-040	11/25/97		FALL	368.	<	--	29.4	8.28 |Jc	--	41.5	448. |Jc
UCD2-039	12/01/97		FALL	338.	<	--	25.7	2.99	--	37.3	433. |Jc
UCD4-041	11/24/97		FALL	331.	<	--	18.4	3.09	--	37.3	404. |Jc
UCD4-042	11/21/97		FALL	342.	0.138	--	22.8	5.45 H|Jh	--	44.4	467. |Jc
UCD4-043	11/21/97		FALL	346.	<	--	18.5	3.18 H|Jh	--	33.9	406. |Jc

TABLE 5.4
SUMMARY OF CHEMICAL DETECTIONS - GROUNDWATER
GENERAL CHEMICALS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	TOTAL KJELDAHL NITROGEN mg/L	TOTAL ORGANIC CARBON mg/L
UCD1-001	02/24/97		WINTER	--	1.4
UCD1-004	02/13/97		WINTER	--	1.3
UCD1-004	05/19/97		SPRING	--	1.05
UCD1-004	09/02/97		SUMMER	--	0.97 B|
UCD1-004	11/17/97		FALL	--	0.77 B|
UCD1-010	02/18/97		WINTER	--	2.7
UCD1-010	05/14/97		SPRING	--	--
UCD1-010	08/25/97		SUMMER	--	2.37
UCD1-010	11/18/97		FALL	--	2.81
UCD1-011	02/18/97		WINTER	--	1.7
UCD1-011	08/25/97		SUMMER	--	--
UCD1-012	02/18/97		WINTER	--	3
UCD1-012	05/15/97		SPRING	--	2.25
UCD1-012	08/21/97		SUMMER	--	2.92
UCD1-012	08/21/97	D	SUMMER	--	2.99
UCD1-012	11/17/97		FALL	--	2.31
UCD1-013	02/18/97		WINTER	--	1.6
UCD1-013	05/15/97		SPRING	--	1.45
UCD1-013	08/21/97		SUMMER	--	1.48
UCD1-013	11/18/97		FALL	--	1.33
UCD1-018	02/20/97		WINTER	--	1.5
UCD1-018	08/27/97		SUMMER	--	--
UCD1-019	02/19/97		WINTER	--	1.6
UCD1-020	02/24/97		WINTER	--	0.9 B|
UCD1-021	02/24/97		WINTER	--	1.3
UCD1-021	02/24/97	D	WINTER	--	1.2
UCD1-022	02/25/97		WINTER	--	1.4
UCD1-022	08/20/97		SUMMER	--	1.01
UCD1-023	02/13/97		WINTER	--	1.3
UCD1-024	02/25/97		WINTER	--	1.4
UCD1-024	11/19/97		FALL	--	--
UCD1-025	02/13/97		WINTER	0.6	1.2
UCD1-025	05/19/97		SPRING	7.38	1.05
UCD1-025	08/26/97		SUMMER	--	--
UCD1-025	11/18/97		FALL	--	--
UCD1-027Z3	02/28/97		WINTER	3.2	7.7
UCD1-027Z3	05/20/97		SPRING	8	7.57
UCD1-028	11/24/97		FALL	0.6	1.52
UCD1-034	02/12/97		WINTER	1	1.6
UCD1-034	05/19/97		SPRING	--	--
UCD1-034	08/25/97		SUMMER	--	--
UCD2-007	02/24/97		WINTER	--	0.8 B|
UCD2-007	08/26/97		SUMMER	--	--
UCD2-014	02/18/97		WINTER	--	1.7
UCD2-014	02/18/97	D	WINTER	--	1.4
UCD2-014	05/15/97		SPRING	--	1.43

TABLE 5.4
SUMMARY OF CHEMICAL DETECTIONS - GROUNDWATER
GENERAL CHEMICALS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	TOTAL KJELDAHL NITROGEN mg/L	TOTAL ORGANIC CARBON mg/L
UCD2-014	08/21/97		SUMMER	--	1.06
UCD2-014	11/19/97		FALL	--	0.98 B|
UCD2-015	02/13/97		WINTER	--	1.1
UCD2-015	05/19/97		SPRING	--	1.04
UCD2-015	09/02/97		SUMMER	--	0.78 B|
UCD2-015	11/17/97		FALL	--	0.56 B|
UCD2-015	11/17/97	D	FALL	--	0.67 B|
UCD2-016	02/19/97		WINTER	--	1.3
UCD2-016	05/14/97		SPRING	--	--
UCD2-016	08/26/97		SUMMER	--	0.75 B|
UCD2-016	11/17/97		FALL	--	0.48 B|
UCD2-017	02/19/97		WINTER	--	0.9 B|
UCD2-017	08/27/97		SUMMER	--	--
UCD2-026	02/13/97		WINTER	<	0.9 B|
UCD2-026	05/19/97		SPRING	7.09	1.11
UCD2-026	05/19/97	D	SPRING	6.43	0.96 B|
UCD2-026	08/26/97		SUMMER	--	--
UCD2-026	11/18/97		FALL	--	--
UCD2-027Z4	02/27/97		WINTER	3.2	4.2
UCD2-027Z4	05/20/97		SPRING	--	--
UCD2-027Z4	05/21/97		SPRING	6.82	1.53
UCD2-027Z5	02/27/97		WINTER	0.9	1.3
UCD2-027Z5	05/21/97		SPRING	3.26	1.08
UCD2-027Z6	02/26/97		WINTER	1.6	1.3
UCD2-027Z6	05/21/97		SPRING	5.96	1.01
UCD2-027Z7	02/26/97		WINTER	2.3	1.4
UCD2-027Z7	05/22/97		SPRING	7.61	1.09
UCD2-029	11/24/97		FALL	<	1.3
UCD2-029	11/24/97	D	FALL	<	1.66
UCD2-030	11/25/97		FALL	<	1.15
UCD2-031	11/25/97		FALL	<	1.2
UCD2-032	08/27/97		SUMMER	--	6.08
UCD2-032	11/21/97		FALL	<	1.48
UCD2-035	02/12/97		WINTER	0.7	1.1
UCD2-035	05/13/97		SPRING	7.49	1.08
UCD2-035	08/25/97		SUMMER	--	--
UCD2-036	12/01/97		FALL	<	1
UCD2-037	12/01/97		FALL	<	1.49
UCD2-038	11/25/97		FALL	<	1.53
UCD2-040	11/25/97		FALL	<	1.06
UCD2-039	12/01/97		FALL	<	2.18
UCD4-041	11/24/97		FALL	<	1.51
UCD4-042	11/21/97		FALL	<	4.88
UCD4-043	11/21/97		FALL	0.66	1.17

TABLE 5.4
SUMMARY OF CHEMICAL DETECTIONS - GROUNDWATER
SEMI-VOLATILE ORGANIC COMPOUNDS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	ANTHRACENE ug/L	BIS(2-ETHYLHEXYL)PHTHALATE ug/L	BUTYLBENZYLPHTHALATE ug/L	DI-N-BUTYLPHTHALATE ug/L	DI-N-OCTYLPHTHALATE ug/L	PHENOL ug/L	PYRENE ug/L
UCD1-025	02/13/97		WINTER	<	**0.83** J|	--	<	<	<	<
UCD2-026	02/13/97		WINTER	<	**3.0** J|	--	<	<	<	<
UCD2-026	05/19/97		SPRING	<	**6.0** J|	<	<	<	<	<
UCD2-026	05/19/97	D	SPRING	<	**11**	<	<	<	<	<
UCD2-027Z4	05/20/97		SPRING	<	**2.6** J|	<	<	<	<	<
UCD2-027Z7	05/22/97		SPRING	<	**6.3** J|	<	<	<	<	<
UCD2-030	11/25/97		FALL	<	**17**	**0.71** J|	<	**1.4** J|	<	<
UCD2-031	11/25/97		FALL	<	**7.2** J|	**0.55** J|	<	**0.55** J|	<	<
UCD2-032	08/27/97		SUMMER	**2.0** J|	<	<	**0.60** J|	**0.97** J|	<	**1.0** J|
UCD2-032	11/21/97		FALL	<	**8.4** JB|	<	**1.1** J|	**0.97** J|	<	<
UCD2-038	11/25/97		FALL	<	**8.4** J|	<	<	<	<	<
UCD2-040	11/25/97		FALL	<	**7.0** J|	<	<	**4.4** J|	<	<
UCD4-042	11/21/97		FALL	<	**6.6**	<	<	<	**2.5** J|	<
UCD4-043	11/21/97		FALL	<	**3.5** J|	<	<	<	<	<

TABLE 5.4
SUMMARY OF CHEMICAL DETECTIONS - GROUNDWATER
PESTICIDES
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	4,4'-DDD ug/L	ALPHA-CHLORDANE ug/L	DIELDRIN ug/L	ENDRIN ug/L	ENDRIN KETONE ug/L	GAMMA-BHC ug/L	GAMMA-CHLORDANE ug/L	HEPTACHLOR ug/L
UCD1-004	09/02/97		SUMMER	**0.007** J|	<	<	<	<	<	<
UCD1-013	05/15/97		SPRING	<	**0.005** JP|NJu	**0.03**	**0.011** J|	**0.005** J|	**0.004** JP|Ju	<	<
UCD1-013	08/21/97		SUMMER	<	**0.004** J|	**0.017** J|	**0.006** J|	**0.003** J|	<	**0.004** J|	<
UCD2-015	09/02/97		SUMMER	<	<	<	<	<	<	<	<
UCD2-027Z4	05/20/97		SPRING	<	<	<	<	<	<	<	**0.009** J|

TABLE 5.4
SUMMARY OF CHEMICAL DETECTIONS - GROUNDWATER
VOLATILE ORGANIC COMPOUNDS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	1,1,2-TRICHLOROETHANE ug/L	1,1-DICHLOROETHANE ug/L	1,1-DICHLOROETHENE ug/L	1,2-DICHLOROETHANE ug/L	1,2-DICHLOROPROPANE ug/L	1,3-DICHLOROBENZENE ug/L	BENZENE ug/L	BROMODICHLOROMETHANE ug/L
UCD1-004	05/19/97		SPRING	<	<	<	<	<	<	<	<
UCD1-010	02/18/97		WINTER	<	<	<	<	<	<	<	<
UCD1-011	02/18/97		WINTER	<	<	<	<	<	<	<	<
UCD1-011	08/25/97		SUMMER	<	<	<	<	<	<	<	<
UCD1-012	02/18/97		WINTER	1 J|	5.6	9.9	2.8	0.3 J|	<	<	8.3
UCD1-012	05/15/97		SPRING	<	7.6 J|JQ	10 J|JQ	<	<	<	<	<
UCD1-012	08/21/97		SUMMER	2.3	11 |Ji	15 |Ji	5.2 |Ji	0.7	<	<	0.9
UCD1-012	08/21/97	D	SUMMER	3.3 |Ji	13 |Ji	18 |Ji	6.0 |Ji	0.8 |Ji	<	<	0.9 |Ji
UCD1-012	11/17/97		FALL	1.0 J|	6.3	8.3	3.9	0.5 J|	<	<	0.6 J|
UCD1-013	02/18/97		WINTER	<	<	<	<	<	<	<	<
UCD1-013	05/15/97		SPRING	<	<	<	<	<	<	<	<
UCD1-013	08/21/97		SUMMER	<	<	<	<	<	<	<	<
UCD1-013	11/18/97		FALL	<	<	<	<	<	<	<	<
UCD1-020	02/24/97		WINTER	<	<	<	<	<	<	<	<
UCD1-021	02/24/97		WINTER	<	<	<	<	<	<	<	<
UCD1-021	02/24/97	D	WINTER	<	<	<	<	<	<	<	<
UCD1-023	02/13/97		WINTER	<	<	<	<	<	<	<	<
UCD1-024	02/25/97		WINTER	<	<	<	<	<	<	<	<
UCD1-024	11/19/97		FALL	<	<	<	<	<	<	<	<
UCD1-025	02/13/97		WINTER	<	<	<	<	<	<	<	<
UCD1-025	05/19/97		SPRING	<	<	<	<	<	<	<	<
UCD1-025	11/18/97		FALL	<	<	<	<	<	<	<	<
UCD1-027Z3	02/28/97		WINTER	<	<	<	<	<	<	<	<
UCD1-027Z3	05/20/97		SPRING	<	<	<	<	<	<	<	<
UCD1-028	11/24/97		FALL	<	<	<	<	<	<	<	<
UCD2-014	02/18/97		WINTER	<	<	<	<	<	<	<	<
UCD2-014	02/18/97	D	WINTER	<	<	<	<	<	<	<	<
UCD2-014	05/15/97		SPRING	<	<	<	<	<	<	<	<
UCD2-014	08/21/97		SUMMER	<	<	<	<	<	<	<	<
UCD2-016	08/26/97		SUMMER	<	<	<	<	<	<	<	<
UCD2-026	02/13/97		WINTER	<	0.2 J|	0.3 J|	0.4 J|	0.2 J|	<	<	<
UCD2-026	05/19/97		SPRING	<	<	<	<	<	<	<	<
UCD2-026	05/19/97	D	SPRING	<	<	<	<	<	<	<	<
UCD2-026	11/18/97		FALL	<	<	<	<	<	<	<	<
UCD2-027Z4	02/27/97		WINTER	<	0.4 J|	0.5 J|	0.6 J|	0.4 J|	<	<	0.3 J|
UCD2-027Z4	05/20/97		SPRING	<	<	<	<	<	<	<	<
UCD2-027Z5	02/27/97		WINTER	<	<	<	0.5 J|	0.3 J|	<	<	<
UCD2-027Z5	05/21/97		SPRING	<	<	<	0.3 J|	<	<	<	<
UCD2-027Z6	02/26/97		WINTER	<	<	<	<	<	<	<	<
UCD2-027Z6	05/21/97		SPRING	<	<	<	<	<	<	<	<
UCD2-027Z7	02/26/97		WINTER	<	<	<	<	<	<	<	<
UCD2-027Z7	05/22/97		SPRING	<	<	<	<	<	<	<	<
UCD2-029	11/24/97		FALL	<	0.8 J|	0.8 J|	1.7	1.6	<	<	<
UCD2-029	11/24/97	D	FALL	0.2 J|	0.8 J|	0.9 J|	1.7	1.6	<	<	<
UCD2-030	11/25/97		FALL	<	0.8 J|	0.6 J|	1.3	0.8 J|	<	<	<
UCD2-031	11/25/97		FALL	<	<	<	<	<	<	<	<

TABLE 5.4
SUMMARY OF CHEMICAL DETECTIONS - GROUNDWATER
VOLATILE ORGANIC COMPOUNDS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	1,1,2-TRICHLOROETHANE ug/L	1,1-DICHLOROETHANE ug/L	1,1-DICHLOROETHENE ug/L	1,2-DICHLOROETHANE ug/L	1,2-DICHLOROPROPANE ug/L	1,3-DICHLOROBENZENE ug/L	BENZENE ug/L	BROMODICHLOROMETHANE ug/L
UCD2-032	11/21/97		FALL	<	**1.0**	**0.9** J|	**1.7**	**1.2**	<	<	<
UCD2-035	05/13/97		SPRING	<	<	<	<	<	<	<	<
UCD2-040	11/25/97		FALL	<	**0.8** J|	**0.8** J|	<	**1.2**	**1.5**	<	<
UCD4-041	11/24/97		FALL	<	<	<	<	<	<	<	<
UCD4-042	11/21/97		FALL	<	**0.3** J|	**0.2** J|	**0.6** J|	**0.4** J|	<	**0.3** J|	<
UCD4-043	11/21/97		FALL	<	<	<	<	<	<	<	<

TABLE 5.4
SUMMARY OF CHEMICAL DETECTIONS - GROUNDWATER
VOLATILE ORGANIC COMPOUNDS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	CHLOROFORM ug/L	DIBROMOCHLOROMETHANE ug/L	METHYLENE CHLORIDE ug/L	TETRACHLOROETHENE ug/L	TOLUENE ug/L	TRANS-1,2-DICHLOROETHENE ug/L	TRICHLOROETHENE ug/L	XYLENES (TOTAL) ug/L
UCD1-004	05/19/97		SPRING	<	<	<	<	<	<	<	0.3 J|
UCD1-010	02/18/97		WINTER	<	<	<	<	<	<	<	<
UCD1-011	02/18/97		WINTER	0.7 J|	<	<	<	<	<	<	<
UCD1-011	08/25/97		SUMMER	0.5 J|	<	<	<	<	<	<	<
UCD1-012	02/18/97		WINTER	5300	0.6 J|	0.4 J|	<	<	0.2 J|	<	<
UCD1-012	05/15/97		SPRING	4600	<	<	<	<	<	<	<
UCD1-012	08/21/97		SUMMER	7900 |Js	<	<	<	<	<	0.3 J|	<
UCD1-012	08/21/97	D	SUMMER	7000	<	<	<	<	<	<	<
UCD1-012	11/17/97		FALL	5100	<	<	<	<	<	<	<
UCD1-013	02/18/97		WINTER	1.0 J|	<	<	<	<	<	<	<
UCD1-013	05/15/97		SPRING	1.7	<	<	<	<	<	0.3 J|	<
UCD1-013	08/21/97		SUMMER	1.2	<	<	<	<	<	0.2 J|	<
UCD1-013	11/18/97		FALL	0.8 J|	<	<	<	<	<	<	<
UCD1-020	02/24/97		WINTER	<	<	<	<	<	<	<	<
UCD1-021	02/24/97		WINTER	0.4 J|	<	<	<	<	<	<	<
UCD1-021	02/24/97	D	WINTER	0.5 J|	<	<	<	<	<	<	<
UCD1-023	02/13/97		WINTER	0.5 J|	<	<	<	<	<	<	<
UCD1-024	02/25/97		WINTER	0.5 J|	<	<	0.4 J|	<	<	<	<
UCD1-024	11/19/97		FALL	0.3 J|	<	<	0.4 J|	<	<	<	<
UCD1-025	02/13/97		WINTER	1.1	<	<	<	<	<	<	<
UCD1-025	05/19/97		SPRING	1.4	<	<	<	<	<	<	<
UCD1-025	11/18/97		FALL	1.7	<	<	<	<	<	<	<
UCD1-027Z3	02/28/97		WINTER	0.7 J|	<	<	<	<	<	<	<
UCD1-027Z3	05/20/97		SPRING	0.2 J|	<	<	<	<	<	<	<
UCD1-028	11/24/97		FALL	0.4 J|	<	<	<	<	<	<	<
UCD2-014	02/18/97		WINTER	0.6 J|	<	<	<	<	<	<	<
UCD2-014	02/18/97	D	WINTER	0.6 J|	<	<	<	<	<	<	<
UCD2-014	05/15/97		SPRING	0.7	<	<	<	<	<	<	<
UCD2-014	08/21/97		SUMMER	1.1	<	0.4 J|	<	<	<	<	<
UCD2-016	08/26/97		SUMMER	<	<	<	<	0.4 J|	<	<	<
UCD2-026	02/13/97		WINTER	43	<	<	<	<	<	<	<
UCD2-026	05/19/97		SPRING	17	<	<	<	<	<	<	<
UCD2-026	05/19/97	D	SPRING	17	<	<	<	<	<	<	<
UCD2-026	11/18/97		FALL	7.5	<	<	<	<	<	<	<
UCD2-027Z4	02/27/97		WINTER	100	<	0.5 J|	<	<	<	<	<
UCD2-027Z4	05/20/97		SPRING	33	<	<	<	<	<	<	<
UCD2-027Z5	02/27/97		WINTER	38	<	<	<	<	<	<	<
UCD2-027Z5	05/21/97		SPRING	56	<	<	<	<	<	<	<
UCD2-027Z6	02/26/97		WINTER	4.9	<	<	<	<	<	<	<
UCD2-027Z6	05/21/97		SPRING	3.7	<	<	<	<	<	<	<
UCD2-027Z7	02/26/97		WINTER	0.6 J|	<	<	<	<	<	<	<
UCD2-027Z7	05/22/97		SPRING	1.2	<	<	<	<	<	<	<
UCD2-029	11/24/97		FALL	130 B|	<	<	<	<	<	<	<
UCD2-029	11/24/97	D	FALL	140 B|	<	<	<	<	<	<	<
UCD2-030	11/25/97		FALL	42	<	<	<	<	<	<	<
UCD2-031	11/25/97		FALL	48	<	<	<	<	<	<	<

TABLE 5.4
SUMMARY OF CHEMICAL DETECTIONS - GROUNDWATER
VOLATILE ORGANIC COMPOUNDS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	CHLOROFORM ug/L	DIBROMOCHLOROMETHANE ug/L	METHYLENE CHLORIDE ug/L	TETRACHLOROETHENE ug/L	TOLUENE ug/L	TRANS-1,2-DICHLOROETHENE ug/L	TRICHLOROETHENE ug/L	XYLENES (TOTAL) ug/L
UCD2-032	11/21/97		FALL	**69** B|	<	<	<	<	<	<	<
UCD2-035	05/13/97		SPRING	<	<	<	<	<	<	<	**0.3** J|
UCD2-040	11/25/97		FALL	**37**	<	<	<	<	<	<	<
UCD4-041	11/24/97		FALL	**7.4**	<	<	<	<	<	<	<
UCD4-042	11/21/97		FALL	**37** B|	<	<	<	<	<	<	<
UCD4-043	11/21/97		FALL	**5.1**	<	<	<	<	<	<	<

TABLE 5.4
SUMMARY OF DETECTIONS - GROUNDWATER
RADIONUCLIDES
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	AMERICIUM-241 pCi/L	MDA	BISMUTH-212 pCi/L	MDA	BISMUTH-214 pCi/L	MDA	CARBON-14 pCi/L	MDA	GROSS ALPHA pCi/L	MDA	GROSS BETA pCi/L	MDA	LEAD-214 pCi/L	MDA	PLUTONIUM-241 pCi/L	MDA
UCD1-004	09/02/97		SUMMER	--		<		12.7±5.9	7.4	--		<		<		<		--	
UCD1-004	11/17/97		FALL	--		<		<		--		<		<		<		--	
UCD1-010	02/18/97		WINTER	--		<		88.±21.	18.	--		<		<		77.±17.	19.	--	
UCD1-011	02/18/97		WINTER	--		<		100±13.	9.6	--		<		<		106.±12.	8.4	--	
UCD1-012	02/18/97		WINTER	--		<		<		88.±26.	33.	<		<		<		--	
UCD1-012	05/15/97		SPRING	--		45.±34.	30.	31.±12.	13.	358.±69.	77.	<		<		33.±10.	|Jd 12.	--	
UCD1-012	08/21/97		SUMMER	--		<		18.±14.	18.	286.±74.	86.	<		<		<		--	
UCD1-012	08/21/97	D	SUMMER	--		<		<		281.±74.	86.	<		<		<		--	
UCD1-012	11/17/97		FALL	--		<		13.±10.	13.	203.±72.	97.	<		<		<		--	
UCD1-013	02/18/97		WINTER	--		<		30.±16.	19.	814.±62.	22.	<		<		35.±13.	16.	--	
UCD1-013	05/15/97		SPRING	--		<		38.±13.	14.	1800±150	80.	<		<		37.±11.	|Jd 12.	--	
UCD1-013	08/21/97		SUMMER	--		46.±33.	42.	<		1524.±98.	20.	<		<		<		--	
UCD1-013	11/18/97		FALL	--		<		<		1428.±93.	20.	<		<		<		--	
UCD1-019	02/19/97		WINTER	--		<		144.±26.	19.	--		<		<		176.±24.	21.	--	
UCD1-020	02/24/97		WINTER	--		<		<		117.±64.	97.	<		<		<		--	
UCD1-021	02/24/97		WINTER	<		<		<		177.±69.	97.	<		<		18.±11.	17.	<	
UCD1-021	02/24/97	D	WINTER	0.039±0.034	0.029	<		<		105.±63.	97.	<		<		<		<	
UCD1-022	02/25/97		WINTER	<		<		<		--		<		<		<		<	
UCD1-023	02/13/97		WINTER	--		<		<		286.±67.	65.	<		<		<		--	
UCD1-024	02/25/97		WINTER	--		<		68.±19.	19.	<		<		<		69.±16.	18.	--	
UCD1-024	11/19/97		FALL	--		<		29.±11.	13.	--		<		<		<		--	
UCD1-025	02/13/97		WINTER	0.036±0.030	0.027	<		19.±15.	19.	71.±44.	65.	<		<		<		<	
UCD1-025	05/19/97		SPRING	<		<		<		230.±60.	77.	<		<		<		<	
UCD1-027Z3	02/28/97		WINTER	<		<		<		<		<		<		<		4.7±2.9	3.4
UCD1-027Z3	05/20/97		SPRING	<		<		<		96.±50.	77.	<		<		<		<	
UCD1-034	02/12/97		WINTER	<		<		<		74.±45.	65.	<		<		<		<	
UCD1-034	05/13/97		SPRING	0.024±0.024	0.017	<		9.8±4.4	5.0	<		<		<		9.2±4.1	|Jd 5.3	<	
UCD2-007	02/24/97		WINTER	--		<		11.4±7.0	9.6	102.±63.	97.	<		<		9.4±6.2	8.9	--	
UCD2-007	08/26/97		SUMMER	--		<		<		<		<		<		<		--	
UCD2-014	02/18/97		WINTER	<		<		58.±18.	|Jf 18.	375.±37.	21.	<		<		43.±15.	19.	<	
UCD2-014	02/18/97	D	WINTER	<		<		21.5±6.8	|Jf 7.8	422.±40.	22.	<		<		25.3±6.3	7.4	<	
UCD2-014	05/15/97		SPRING	<		<		28.±12.	12.	1090±110	80.	<		<		29.±10.	|Jd 12.	<	
UCD2-014	08/21/97		SUMMER	--		<		<		711.±55.	20.	<		<		<		--	
UCD2-014	11/19/97		FALL	--		<		<		464.±42.	20.	<		<		7.5±4.9	7.2	--	
UCD2-015	09/02/97		SUMMER	--		<		10.2±5.9	7.8	--		<		<		<		--	
UCD2-015	11/17/97		FALL	--		<		10.0±5.8	7.5	--		<		<		9.0±5.2	7.6	--	
UCD2-015	11/17/97	D	FALL	--		<		<		--		<		<		<		--	
UCD2-016	02/19/97		WINTER	--		<		151.±27.	22.	--		<		<		155.±23.	19.	--	
UCD2-017	02/19/97		WINTER	--		<		144.±17.	11.	<		<		<		180.±17.	9.1	--	
UCD2-026	02/13/97		WINTER	<		<		<		69.±44.	65.	<		<		<		<	
UCD2-026	05/19/97		SPRING	0.020±0.022	0.018	<		22.7±8.2	|Jf 9.9	<		<		<		16.1±6.9	9.6	<	
UCD2-026	05/19/97	D	SPRING	<		<		<		<		<		<		<		<	
UCD2-027Z4	02/27/97		WINTER	0.043±0.049	0.039	<		<		<		<		<		<		<	
UCD2-027Z4	05/21/97		SPRING	0.033±0.029	0.018	<		<		<		<		<		<		<	
UCD2-027Z5	02/27/97		WINTER	<		<		<		<		7.9±4.8	C| 6.4	7.1±3.6	C| 5.5	<		<	
UCD2-027Z5	05/21/97		SPRING	0.016±0.018	0.014	<		<		<		<		10.6±4.0	C| 5.9	<		<	
UCD2-027Z6	02/26/97		WINTER	<		<		<		<		<		<		<		<	

TABLE 5.4
SUMMARY OF DETECTIONS - GROUNDWATER
RADIONUCLIDES
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Location	Date	QA	Analyte / Units / Quarter	AMERICIUM-241 pCi/L	MDA	BISMUTH-212 pCi/L	MDA	BISMUTH-214 pCi/L	MDA	CARBON-14 pCi/L	MDA	GROSS ALPHA pCi/L	MDA	GROSS BETA pCi/L	MDA	LEAD-214 pCi/L	MDA	PLUTONIUM-241 pCi/L	MDA
UCD2-027Z6	05/21/97		SPRING	**0.021±0.024**	0.019	<		<		<		<		<		<		<	
UCD2-027Z7	02/26/97		WINTER	**0.040±0.040**	0.027	<		**24.±14.**	17.	<		<		<		<		<	
UCD2-027Z7	05/22/97		SPRING	**0.044±0.036**	0.039	<		<		<		<		<		<		<	
UCD2-029	11/24/97		FALL	--		<		<		<		<		<		<		--	
UCD2-029	11/24/97	D	FALL	--		<		<		<		<		<		<		--	
UCD2-031	11/25/97		FALL	--		<		<		<		<		<		<		--	
UCD2-035	02/12/97		WINTER	**0.026±0.025**	0.017	<		<		<		**4.1±2.8**	C| 3.9	<		<		<	
UCD2-035	05/13/97		SPRING	<		<		**10.6±4.6**	5.4	<		<		<		**8.4±4.1**	|Jd 5.3	<	
UCD2-037	12/01/97		FALL	--		<		<		<		<		<		**18.±12.**	17.	--	
UCD2-038	11/25/97		FALL	--		<		<		<		**2.5±1.7**	C|Jd 2.3	<		<		--	
UCD2-040	11/25/97		FALL	--		<		<		<		<		<		<		--	
UCD4-041	11/24/97		FALL	--		<		**16.±13.**	16.	<		<		<		<		--	
UCD4-042	11/21/97		FALL	--		<		<		<		<		**42.8±6.4**	C| 6.6	<		--	

TABLE 5.4
SUMMARY OF DETECTIONS - GROUNDWATER
RADIONUCLIDES
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LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

			Analyte	RADIUM-226		THALLIUM-208		TRITIUM		
			Units	pCi/L		pCi/L		pCi/L		
Location	Date	QA	Quarter		MDA		MDA			MDA
UCD1-004	09/02/97		SUMMER	<		<		<		
UCD1-004	11/17/97		FALL	**0.47±0.32**	0.44	<		<		
UCD1-010	02/18/97		WINTER	--		<		<		
UCD1-011	02/18/97		WINTER	--		<		<		
UCD1-012	02/18/97		WINTER	<		<		<		
UCD1-012	05/15/97		SPRING	**0.59±0.28**	0.27	<		<		
UCD1-012	08/21/97		SUMMER	<		<		<		
UCD1-012	08/21/97	D	SUMMER	**0.73±0.35**	0.36	<		<		
UCD1-012	11/17/97		FALL	**0.53±0.31**	0.37	<		**270±160**		220
UCD1-013	02/18/97		WINTER	<		<		**18600±1200**	Jm	210
UCD1-013	05/15/97		SPRING	<		<		**18300±1200**		190
UCD1-013	08/21/97		SUMMER	<		<		**19000±1200**		190
UCD1-013	11/18/97		FALL	<		<		**19400±1300**		220
UCD1-019	02/19/97		WINTER	--		<		<		
UCD1-020	02/24/97		WINTER	<		<		<		
UCD1-021	02/24/97		WINTER	<		<		<		
UCD1-021	02/24/97	D	WINTER	<		<		<		
UCD1-022	02/25/97		WINTER	<		<		**430±160**	Jm	210
UCD1-023	02/13/97		WINTER	<		<		<		
UCD1-024	02/25/97		WINTER	**0.28±0.14**	0.048	<		<		
UCD1-024	11/19/97		FALL	--		<		--		
UCD1-025	02/13/97		WINTER	**0.28±0.20**	0.26	<		<		
UCD1-025	05/19/97		SPRING	<		<		<		
UCD1-027Z3	02/28/97		WINTER	**0.22±0.15**	0.21	<		**320±140**		190
UCD1-027Z3	05/20/97		SPRING	**0.33±0.20**	0.20	<		<		
UCD1-034	02/12/97		WINTER	<		<		<		
UCD1-034	05/13/97		SPRING	**0.28±0.21**	0.27	<		<		
UCD2-007	02/24/97		WINTER	<		<		<		
UCD2-007	08/26/97		SUMMER	<		3.6±2.7	3.5	<		
UCD2-014	02/18/97		WINTER	<		<		**5490±540**	Jm	220
UCD2-014	02/18/97	D	WINTER	<		<		**5910±560**	Jm	220
UCD2-014	05/15/97		SPRING	<		<		**9540±700**		180
UCD2-014	08/21/97		SUMMER	<		<		**4990±450**		180
UCD2-014	11/19/97		FALL	<		<		**4390±470**		230
UCD2-015	09/02/97		SUMMER	<		<		<		
UCD2-015	11/17/97		FALL	<		<		<		
UCD2-015	11/17/97	D	FALL	<		<		<		
UCD2-016	02/19/97		WINTER	**0.37±0.26**	0.34	<		<		
UCD2-017	02/19/97		WINTER	--		<		<		
UCD2-026	02/13/97		WINTER	<		<		<		
UCD2-026	05/19/97		SPRING	<		<		<		
UCD2-026	05/19/97	D	SPRING	**0.39±0.23**	0.26	<		<		
UCD2-027Z4	02/27/97		WINTER	**0.25±0.15**	0.19	<		<		
UCD2-027Z4	05/21/97		SPRING	**0.49±0.24**	0.28	<		<		
UCD2-027Z5	02/27/97		WINTER	**0.28±0.18**	0.24	<		**1070±210**		190
UCD2-027Z5	05/21/97		SPRING	<		<		<		
UCD2-027Z6	02/26/97		WINTER	0.14±0.11	0.13	<		<		

TABLE 5.4
SUMMARY OF DETECTIONS - GROUNDWATER
RADIONUCLIDES
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LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

			Analyte	RADIUM-226		THALLIUM-208		TRITIUM	
			Units	pCi/L		pCi/L		pCi/L	
Location	Date	QA	Quarter		MDA		MDA		MDA
UCD2-027Z6	05/21/97		SPRING	<		<		<	
UCD2-027Z7	02/26/97		WINTER	<		<		<	
UCD2-027Z7	05/22/97		SPRING	<		<		<	
UCD2-029	11/24/97		FALL	<		<		<	
UCD2-029	11/24/97	D	FALL	<		<		**350±160**	220
UCD2-031	11/25/97		FALL	<		<		**310±160**	220
UCD2-035	02/12/97		WINTER	<		<		**360±150**	200
UCD2-035	05/13/97		SPRING	<		<		<	
UCD2-037	12/01/97		FALL	<		<		<	
UCD2-038	11/25/97		FALL	<		<		<	
UCD2-040	11/25/97		FALL	<		<		250±150	220
UCD4-041	11/24/97		FALL	<		<		<	
UCD4-042	11/21/97		FALL	<		<		<	

TABLE 5.5
SUMMARY OF CHEMICAL DETECTIONS - SURFACE WATER
METALS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	ANTIMONY ug/L		ARSENIC ug/L		BARIUM ug/L		CALCIUM ug/L	CHROMIUM ug/L		CHROMIUM, HEXAVALENT ug/L		COBALT ug/L		COPPER ug/L	
PCD	02/20/97		WINTER	1.1	B|Jn	3.0		46.2		19200	4.7	B|Jn	<		<		2.2	B|Jn
PCD	05/27/97		SPRING	<		<		98.2		32600	7.3	B|	33		<		<	
PCD	05/27/97	D	SPRING	<		<		98.2		32700	7.6	B|	30		<		1.4	B|
PCD	08/29/97		SUMMER	<		<		78.5	E|Jn	28400	<		<		<		<	
PCD	08/29/97	D	SUMMER	<		<		77.8	E|Jn	28000	<		<		<		3.1	B|
PCD	11/12/97		FALL	<		<		108		33000	4.7	B|	4	B|	<		21.6	
PCU	02/20/97		WINTER	<		3.1		45.6		18800	4.9	B|Jn	<		<		2.1	B|Jn
PCU	05/27/97		SPRING	<		<		101		33200	7.9	B|	32		<		1.2	B|
PCU	08/29/97		SUMMER	<		<		84.2	E|Jn	28900	<		<		<		<	
PCU	11/12/97		FALL	<		<		105		31200	6.5	B|	4	B|	<		<	
PCU	11/12/97	D	FALL	<		<		103		31000	4.7	B|	4	B|	<		11.8	|Jf
STPO	02/20/97		WINTER	<		4.9		37.9		22600	3.7	B|Jn	<		<		6.2	B|Jn
STPO	02/20/97	D	WINTER	<		5.1		48.4		22300	6.9	B|Jn	<		1.2	B|Jn	8.7	B|Jn
STPO	05/27/97		SPRING	<		<		46.7		26600	2.9	B|	12		<		5.9	B|
STPO	08/29/97		SUMMER	<		3.3	B|	42.4	E|Jn	26500	<		<		<		8.9	B|
STPO	11/12/97		FALL	<		4.4	B|	48.5		23000	6.4	B|	8	B|	<		12.8	

TABLE 5.5
SUMMARY OF CHEMICAL DETECTIONS - SURFACE WATER
METALS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	IRON ug/L		MAGNESIUM ug/L	MANGANESE ug/L		MOLYBDENUM ug/L		NICKEL ug/L		POTASSIUM ug/L		SELENIUM ug/L	SILVER ug/L	
PCD	02/20/97		WINTER	<		25600	11.8	|Jn	<		5.5	B|Jn	1680	B|	<	<	
PCD	05/27/97		SPRING	<		40800	7	B|	<		2.8	B|	1190	B|	3.7	<	
PCD	05/27/97	D	SPRING	<		40800	7.1	B|	1.1	B|	3.1	B|	<		3.9	<	
PCD	08/29/97		SUMMER	<		37300	10.4	B|	<		<		1340	B|	<	<	
PCD	08/29/97	D	SUMMER	<		36900	<		<		<		1420	B|	<	<	
PCD	11/12/97		FALL	<		40800	<		<		<		2300		<	<	
PCU	02/20/97		WINTER	<		24800	11.5	|Jn	<		5.4	B|Jn	1350	B|	<	1.9	B|
PCU	05/27/97		SPRING	<		41800	5.7	B|	<		2.9	B|	2530	B|	5.1	<	
PCU	08/29/97		SUMMER	<		37700	<		<		<		<		<	<	
PCU	11/12/97		FALL	<		39300	<		<		<		1630	B|	<	<	
PCU	11/12/97	D	FALL	<		39000	<		<		<		1610	B|	<	<	
STPO	02/20/97		WINTER	52.5	B|	29300	3.9	B|Jn	5.6	B|	4.6	B|Jn	10200		3.6	1.1	B|
STPO	02/20/97	D	WINTER	42.7	B|	28900	5.2	B|Jn	7.5	B|	5.8	B|Jn	9510		3.9	1.8	B|
STPO	05/27/97		SPRING	28	E|Jn	34300	4.6	B|	8.4	B|	1.8	B|	8330		7	2.9	B|
STPO	08/29/97		SUMMER	<		32600	10.5	B|	11.8		<		7550		<	<	
STPO	11/12/97		FALL	87.8	B|	26700	<		<		<		12300		<	<	

TABLE 5.5
SUMMARY OF CHEMICAL DETECTIONS - SURFACE WATER
METALS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	SODIUM ug/L	VANADIUM ug/L		ZINC ug/L	
PCD	02/20/97		WINTER	12100	<		7.1	B|Jn
PCD	05/27/97		SPRING	31500	<		3.1	B|
PCD	05/27/97	D	SPRING	31300	<		6.6	B|
PCD	08/29/97		SUMMER	29600	4.5	B|	<	
PCD	08/29/97	D	SUMMER	29400	4.9	B|	<	
PCD	11/12/97		FALL	32100	<		<	
PCU	02/20/97		WINTER	11200	<		4.9	B|Jn
PCU	05/27/97		SPRING	24600	6.2	B|	4.2	B|
PCU	08/29/97		SUMMER	21100	<		<	
PCU	11/12/97		FALL	21800	<		<	
PCU	11/12/97	D	FALL	21600	<		<	
STPO	02/20/97		WINTER	143000	9.3	B|	32.3	|Jn
STPO	02/20/97	D	WINTER	141000	9.4	B|	41.9	|Jn
STPO	05/27/97		SPRING	196000	19.3		20.5	
STPO	08/29/97		SUMMER	174000	14.6	B|	58.8	|Jn
STPO	11/12/97		FALL	143000	12.4		<	

TABLE 5.5
SUMMARY OF CHEMICAL DETECTIONS - SURFACE WATER
GENERAL CHEMICALS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	ALKALINITY, TOTAL (AS CACO3) mg/L		CHLORIDE mg/L		HARDNESS mg/L	NITRATE-N mg/L		SULFATE mg/L		TOTAL DISSOLVED SOLIDS mg/L		TOTAL ORGANIC CARBON mg/L	
PCD	02/20/97		WINTER	--		--		--	0.39		--		170.		3.3	
PCD	05/27/97		SPRING	--		--		249000	3.05		--		305.		3.01	
PCD	05/27/97	D	SPRING	--		--		250000	3.04		--		308.		3.04	
PCD	08/29/97		SUMMER	200.	*	23.1	*	--	1.63	*	24.7	*	261.	*	3.12	
PCD	08/29/97	D	SUMMER	190.	*	23.1	*	--	1.65	*	24.7	*	259.	*	3.32	
PCD	11/12/97		FALL	205.		25.5		--	3.02		29.8		293.	J	3.49	NJ
PCU	02/20/97		WINTER	--		--		--	0.35		--		146.		3.3	
PCU	05/27/97		SPRING	--		--		255000	2.69		--		280.		2.87	
PCU	08/29/97		SUMMER	187.	*	13.7	*	--	1.45	*	20.7	*	204.	*	3.1	
PCU	11/12/97		FALL	206.		17.9		--	2.66		27.8		276.	J	2.91	NJ
PCU	11/12/97	D	FALL	204.		17.9		--	2.64		27.8		286.	J	3.21	
STPO	02/20/97		WINTER	--		--		--	7.37		--		561.		9	
STPO	02/20/97	D	WINTER	--		--		--	7.32		--		566.		9.1	
STPO	05/27/97		SPRING	--		--		208000	7.8		--		700.		8.26	
STPO	08/29/97		SUMMER	256.	*	139	*	--	4.96	*	76	*	629.	*	6.06	
STPO	11/12/97		FALL	216.		123		--	9.55		57.3		572.	J	9.53	NJ

TABLE 5.5
SUMMARY OF CHEMICAL DETECTIONS - SURFACE WATER
VOLATILE ORGANIC COMPOUNDS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	ACETONE ug/L		BROMODICHLOROMETHANE ug/L		BROMOFORM ug/L	CHLOROFORM ug/L		DIBROMOCHLOROMETHANE ug/L		METHYLENE CHLORIDE ug/L	
PCD	05/27/97		SPRING	<		0.9	J|	<	0.9		0.8	J|	<	
PCD	05/27/97	D	SPRING	<		0.8	J|	<	0.9		0.7	J|	<	
PCD	09/03/97		SUMMER	<		0.5	J|	<	0.7		<		<	
PCD	09/03/97	D	SUMMER	6.3	|Jcf	0.6		<	0.8		0.6		<	
PCD	11/12/97		FALL	2.6	J|	<		<	0.3	J|	<		<	
PCU	09/03/97		SUMMER	1.1	|Jc	<		<	<		<		<	
PCU	11/12/97	D	FALL	1.5	J|	<		<	<		<		<	
STPO	02/20/97		WINTER	<		1.4		<	4.5		<		<	
STPO	02/20/97	D	WINTER	<		1.4		<	4.7		0.4	J|	<	
STPO	05/27/97		SPRING	3.8	J|	19		2.7	14		18		0.5	J|
STPO	09/03/97		SUMMER	6.9	|Jc	19		2.9	13		18		<	
STPO	11/12/97		FALL	2.9	J|	3.1		<	4.3		1.1		1.0	J|

TABLE 5.5
SUMMARY OF CHEMICAL DETECTIONS - SURFACE WATER
SEMI-VOLATILE ORGANIC COMPOUNDS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

			Analyte	BIS(2-ETHYLHEXYL)PHTHALATE	
			Units	ug/L	
Location	Date	QA	Quarter		
STPO	02/20/97		WINTER	**0.70**	J|
STPO	02/20/97	D	WINTER	**0.56**	J|

TABLE 5.5
SUMMARY OF CHEMICAL DETECTIONS - SURFACE WATER
PESTICIDES
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	4,4'-DDD ug/L	4,4'-DDT ug/L	ALDRIN ug/L	ALPHA-CHLORDANE ug/L	HEPTACHLOR EPOXIDE ug/L
PCD	08/29/97		SUMMER	**0.01** J|	<	<	<
PCU	08/29/97		SUMMER	<	**0.039** |Jw	**0.003** J|	<	**0.003** J|
STPO	08/29/97		SUMMER	**0.027**	<	<	**0.007** JP|JNu	<

TABLE 5.5
SUMMARY OF CHEMICAL DETECTIONS - SURFACE WATER
RADIONUCLIDES
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	AMERICIUM-241 pCi/L	MDA	BISMUTH-214 pCi/L	MDA	GROSS BETA pCi/L	MDA	LEAD-212 pCi/L	MDA	LEAD-214 pCi/L	MDA	RADIUM-226 pCi/L	MDA	TRITIUM pCi/L	MDA
PCD	02/20/97		WINTER	<		<		**2.7±1.4**	2.2	<		<		<		<	
PCD	05/27/97		SPRING	<		<		<		<		<		<		**790±230**	240
PCD	05/27/97	D	SPRING	**0.026±0.025**	0.017	**23.±14.** |Jf	18.	<		**48.±14.** |Jf	15.	<		<		**710±220**	230
PCD	11/12/97		FALL	--		**11.3±9.1**	12.	<		<		<		<		<	230
PCU	02/20/97		WINTER	<		**17.1±7.5**	9.7	<		<		**10.4±6.4**	9.2	<		<	
PCU	05/27/97		SPRING	<		<		<		<		<		**0.19±0.18**	0.13	<	
PCU	11/12/97		FALL	--		--		--		--		--		--		<	
PCU	11/12/97	D	FALL	--		--		--		--		--		--		<	
STPO	02/20/97		WINTER	<		<		**19.7±4.4** C|Jf	5.6	<		<		<		<	
STPO	02/20/97	D	WINTER	--		--		--		--		--		--		<	
STPO	02/24/97	D	WINTER	<		<		**10.4±3.9** C|Jf	5.8	<		<		<		--	
STPO	05/27/97		SPRING	<		<		**13.8±5.1** C|	7.4	<		<		<		<	
STPO	11/12/97		FALL	--		--		--		--		--		--		<	

TABLE 5.6
SUMMARY OF CHEMICAL DETECTIONS - STORM WATER
GENERAL CHEMICALS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	ALKALINITY, TOTAL (AS CACO3) mg/L	AMMONIA-NITROGEN mg/L	CHEMICAL OXYGEN DEMAND mg/L	CHLORIDE mg/L	HARDNESS mg/L	NITRATE-N mg/L	OIL AND GREASE mg/L	PHOSPHATE, TOTAL (AS P) mg/L
LF-1	11/14/97		FALL	9.8 B|	--	--	1.12	--	1.48	--	--
LF-3	05/23/97		SPRING	155.	--	--	9.35	158	0.645	--	--
LF-3	11/26/97		FALL	65.7	--	--	16.2	55.6	--	--	--
LF-3	11/26/97	D	FALL	65.1	--	--	16.4	54.6	--	--	--
LS-1	12/10/96		FALL	--	--	--	--	--	2.0	--	--
LS-1	05/23/97		SPRING	57.8	1.28	83	88.6	--	0.961	--	0.576
LS-1	05/23/97	D	SPRING	62.1	1.06	95.6	89.1	--	0.983	1.2	0.591
LS-1	11/14/97		FALL	10.8 H|	--	--	2.18	--	0.254 H|	--	--
SD-1	12/10/96		FALL	--	--	--	--	--	0.42	--	--

TABLE 5.6
SUMMARY OF CHEMICAL DETECTIONS - STORM WATER
GENERAL CHEMICALS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	SULFATE mg/L	SURVIVAL BIOASSAY %	TOTAL DISSOLVED SOLIDS mg/L	TOTAL KJELDAHL NITROGEN mg/L	TOTAL ORGANIC CARBON mg/L
LF-1	11/14/97		FALL	**0.898** B|	**95**	**36.0** |Jc	--	**3.93** N|Jm
LF-3	05/23/97		SPRING	**18.5**	**100**	**247.**	--	**28.3**
LF-3	11/26/97		FALL	**8.25**	--	**167.** |Jc	--	**11.9**
LF-3	11/26/97	D	FALL	**8.11**	--	**179.** |Jc	--	**13**
LS-1	12/10/96		FALL	--	--	**350**	--	--
LS-1	05/23/97		SPRING	**8.47**	**100**	**283**	**3.29**	**32.1**
LS-1	05/23/97	D	SPRING	**8.5**	--	**266**	**3.75**	**35.9**
LS-1	11/14/97		FALL	**1.85**	**100**	**51**	--	**13.4**
SD-1	12/10/96		FALL	--	--	**160**	--	--

TABLE 5.6
SUMMARY OF CHEMICAL DETECTIONS - STORM WATER
METALS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	ANTIMONY ug/L	ARSENIC ug/L	BARIUM ug/L	CALCIUM ug/L	CHROMIUM ug/L	COBALT ug/L	COPPER ug/L	IRON ug/L
LF-1	11/14/97		FALL	4.2 B|	<	9.7 B|	2750	<	<	10.9	<
LF-3	05/23/97		SPRING	1.1 B|	<	82 |Jn	20000	1.7 B|	1.4 B|	8.5 B|	<
LF-3	11/26/97		FALL	<	3.1 B|	36.6	8550	<	<	15.6	<
LF-3	11/26/97	D	FALL	<	3.1 B|	40.9	8310	<	<	15.6	910 |Jf
LS-1	12/10/96		FALL	<	15.6	293	18600	115	25.8	74	39000
LS-1	05/23/97		SPRING	25.6	6	33.6	10500	<	1.3 B|J	<	<
LS-1	05/23/97	D	SPRING	29	8.5	33	10100	<	1.4 B|J	<	<
LS-1	11/14/97		FALL	4.4 B|	<	<	2290 B|	<	<	3.5 B|	95.7
SD-1	12/10/96		FALL	<	6.9	161	9010	64	16.4	41.5	22000

TABLE 5.6
SUMMARY OF CHEMICAL DETECTIONS - STORM WATER
METALS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	LEAD ug/L	MAGNESIUM ug/L	MANGANESE ug/L	MERCURY ug/L	MOLYBDENUM ug/L	NICKEL ug/L	POTASSIUM ug/L	SELENIUM ug/L
LF-1	11/14/97		FALL	<	2000 B|	<	<	<	2780	<
LF-3	05/23/97		SPRING	<	26100	69.7 |Jn	<	1.0 B|	9.7 B|	19300	4.4
LF-3	11/26/97		FALL	<	8320	<	<	<	23.4	27500	<
LF-3	11/26/97	D	FALL	<	8220	<	<	<	33.4	27300	<
LS-1	12/10/96		FALL	12.4	31300	570	0.79 *|Jd	4.9 B|	247	61900	<
LS-1	05/23/97		SPRING	2 B|J	7310	63.4	0.2	1.1 B|J	8.1 B|J	5170	<
LS-1	05/23/97	D	SPRING	2.3	7040	67.2	0.2	<	8.2 B|J	4520	<
LS-1	11/14/97		FALL	1.4 B|	1070 B|	11.4 B|	<	1.2 B|	2.2 B|	2160 B|	<
SD-1	12/10/96		FALL	23.5	14200	486	0.20 *|	<	140	6660	<

TABLE 5.6
SUMMARY OF CHEMICAL DETECTIONS - STORM WATER
METALS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	SILVER ug/L	SODIUM ug/L	VANADIUM ug/L	ZINC ug/L
LF-1	11/14/97		FALL	<	1450 B|	<	<
LF-3	05/23/97		SPRING	<	10900	<	18.5 B|
LF-3	11/26/97		FALL	<	9020	<	<
LF-3	11/26/97	D	FALL	<	8700	4.5 B|	<
LS-1	12/10/96		FALL	<	17600	73.5	183 N|Jm
LS-1	05/23/97		SPRING	<	70500	<	95.6
LS-1	05/23/97	D	SPRING	1	68500	<	94.1
LS-1	11/14/97		FALL	1	3500 Be|	<	43.1
SD-1	12/10/96		FALL	<	4040	41.9	236 N|Jm

TABLE 5.6
SUMMARY OF CHEMICAL DETECTIONS - STORM WATER
VOLATILE ORGANIC COMPOUNDS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

Location	Date	QA	Analyte / Units / Quarter	2-BUTANONE ug/L		ACETONE ug/L		TOLUENE ug/L		XYLENES (TOTAL) ug/L	
LF-1	11/14/97		FALL	--		5.5	J|c	--		--	
LF-3	05/23/97		SPRING	**3.3**	J|	**8.9**		--		--	
LF-3	11/26/97		FALL	**1.0**	J|	--		--		--	
LF-3	11/26/97	D	FALL	--		--		--		--	
LS-1	05/23/97		SPRING	--		**10**		**0.3**	J|J	**0.2**	J|J
LS-1	05/23/97	D	SPRING	--		**11**		--		--	

TABLE 5.6
SUMMARY OF CHEMICAL DETECTIONS - STORM WATER
SEMI-VOLATILE ORGANIC COMPOUNDS
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

			Analyte	BIS(2-ETHYLHEXYL)PHTHALATE	
			Units	ug/L	
Location	Date	QA	Quarter		
SD-1	12/10/96		FALL	1.8	J|

TABLE 5.6
SUMMARY OF CHEMICAL DETECTIONS - STORM WATER
PESTICIDES
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

			Analyte	ALPHA-CHLORDANE		GAMMA-CHLORDANE	
			Units	ug/L		ug/L	
Location	Date	QA	Quarter				
LS-1	05/23/97		SPRING	**0.0078**	JP|J	**0.0097**	JP|J
LS-1	05/23/97	D	SPRING	**0.017**	P|J	**0.013**	P|J

TABLE 5.6
SUMMARY OF CHEMICAL DETECTIONS - STORM WATER
RADIONUCLIDES
1997 ANNUAL WATER MONITORING REPORT
LEHR/SCDS ENVIRONMENTAL RESTORATION - DAVIS, CALIFORNIA

			Analyte	AMERICIUM-241		CARBON-14		GROSS ALPHA		GROSS BETA		RADIUM-226	
			Units	pCi/L		pCi/L		pCi/L		pCi/L		pCi/L	
Location	Date	QA	Quarter		MDA		MDA		MDA		MDA		MDA
LF-1	11/14/97		FALL	--		<		<		**4.0±1.4**	2.1	<	
LF-3	05/23/97		SPRING	--		<		<		**26.2±3.5**	3.4	**0.21±0.23**	0.19
LF-3	11/26/97		FALL	--		<		<		**24.3±3.0**	2.7	<	
LF-3	11/26/97	D	FALL	--		<		<		**27.2±3.4** C|	3.1	**1.09±0.36** |Jf	0.21
LS-1	12/10/96		FALL	<		**64.±39.**	59	<		**62.3±6.8** C|	5.7	**0.42±0.23** |Jm	0.29
LS-1	05/23/97		SPRING	**0.021±0.021**	0.014	<		<		**5.4±2**	3	<	
LS-1	05/23/97	D	SPRING	<		<		<		**4.7±1.9**	2.9	<	
LS-1	11/14/97		FALL	--		<		<		**3.2±1.4**	2.1	**0.46±0.32**	0.43
SD-1	12/10/96		FALL	**0.032±0.028**	0.017	**60.±38.**	59	**4.7±2.5** C|	3.2	**11.8±2.0**	2.3	--	

Attachment 6.1

QUALITY CONTROL/QUALITY ASSURANCE CHECK LIST FOR DOCUMENTS

For each LEHR document, this check list must be attached behind the "pink sheet" when it is first submitted to the AAs for editing. It must be filled out and remain with the document throughout the editing process.

ITEMS TO BE QA/QC'D	REVIEW COMPLETED Reviewer's initials/date	CORRECTIONS MADE AND VERIFIED Reviewer's initials/date
Does document conform to WA Document Style Manual?	✓ 9-28-98	
Are cover pages in proper LEHR format?	✓	
Are headers and footers correct (especially page #s) and in LEHR format?	✓	
Does Table of Contents (TOC) match headings in report?	✓	
Do page numbers in TOC agree with actual text, figures, tables, etc.?	✓	
Do figure captions, table headers, appendix title sheets agree with TOC?	✓	
Are figures and tables properly cited in text (i.e., first citations are in numerical order, and all number citations are correct)?	✓	
Are all data entries in text, supporting tables, and/or figures consistent with one another?	✓	
Are all Section references correct?	✓	
Are reference citations included in References section?	✓	
Is format consistent in References section?	✓	
Are all Appendices complete and included in the proper order?	N/A	
Was Spell Check completed?	✓	
Was report checked for typos, grammar?	✓	