U.S. Department of Energy

Oakland Operations Office, Oakland, California

FINAL SOUTHWEST TRENCHES AREA 1998 REMOVAL ACTION CONFIRMATION REPORT

for the:

LABORATORY FOR ENERGY-RELATED HEALTH RESEARCH
UNIVERSITY OF CALIFORNIA, DAVIS

Prepared for:

United States Department of Energy
Oakland Operations Office
1301 Clay Street
Oakland, California 94612-5208

Prepared by:

Weiss Associates
5801 Christie Avenue, Suite 600
Emeryville, California 94608-1827

June 13, 2001
Rev. 0

DOE Oakland Operations Contract DE-AC03-96SF20686

Weiss Associates
Environmental Science, Engineering and Management

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ABBREVIATIONS AND ACRONYMS

ALARA	As-Low-As-Reasonably-Achievable
Am-241	americium-241
AML	air monitoring location
bgs	below ground surface
C-14	carbon-14
CFR	Code of Federal Regulations
COC	Constituent of concern
Cs-137	cesium-137
cu yds	cubic yards
DAC	derived air concentration
DCG	Derived Concentration Guide
DL	Designated Level
DOE	U.S. Department of Energy
DP	daughter products
EE/CA	Engineering Evaluation/Cost Analysis
ER/WM	Environmental Restoration/Waste Management
ft	feet
GM	Geiger-Muller
HDPE	high density polyethylene
HQ	Hazard Quotient
HSP	Health and Safety Procedure
LDR	Land Disposal Restriction
LEHR	Laboratory for Energy-Related Health Research
MCL	maximum contaminant level
MDA	minimum detectable activities
mg/kg	milligram per kilogram

mL/g	milliliter per gram
mL/kg	milliliter per kilogram
MOA	Memorandum of Agreement
NaI	sodium-iodide
NCP	National Contingency Plan
NO_3	nitrate
NUFT	Non-isothermal, Unsaturated Flow and Transport
OSC	On-Scene Coordinator
OSHA	Occupational Safety and Health Administration
Pb-210	lead-210
pCi/g	picoCuries per gram
PHSP	Project Health and Safety Plan
PID	photoionization detector
ppb	parts per billion
PPE	personal protective equipment
PRGs	Preliminary Remediation Goals
Pu-241	plutonium-241
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RA	removal action
Ra-226	radium-226
RAOs	Removal Action Objectives
RBAS	Risk-Based Action Standards
RCRA	Resource Conservation and Recovery Act
RCTs	Radiological Control Technicians
RDL	reported detection limit
RME	reasonable maximum exposure
RMMA	Radioactive Materials Management Area
RPP	Radiological Protection Program
RSO	Radiological Safety Officer
SC	Screening Criteria

SOP	Standard Operating Procedure
Sr-90	strontium-90
SVOC	semi-volatile organic compound
SWT Area	Southwest Trenches Area
TWA	Time Weighted Average
UC Davis	University of California, Davis
UCL	upper confidence limit
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WA	Weiss Associates
WP	Work Plan
WPO	Waste Packaging Observer
WRS Test	Wilcoxon Rank Sum Test
μCi	MicroCuries
μg/kg	micrograms per kilogram

EXECUTIVE SUMMARY

This report presents the results of the non-time-critical Removal Action (RA) conducted at the Southwest Trenches Area (SWT Area) located at the Laboratory for Energy-Related Health Research (LEHR), University of California, Davis (UC Davis), California. This RA Confirmation Report includes the Phase II data evaluation described in the RA Work Plan (WA, 1998a). The RA was implemented in accordance with the National Contingency Plan (NCP), 40 Code of Federal Regulations Part 300.415. This report is written in accordance with the section "*Superfund Removal Procedures, Removal Response Reporting: POLREPS and OSC Reports*," United States Environmental Protection Agency (USEPA) Publication 9360.3-03, June 1994. This report was prepared by Weiss Associates (WA) under Department of Energy (DOE) Environmental Restoration/Waste Management (ER/WM) Contract No. DE-AC03-96SF20686.

The objectives of the RA were defined in the *Engineering Evaluation/Cost Analysis (EE/CA) Report* (WA, 1998b) as follows:

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

The RA at the Site was conducted in accordance with the *Draft Final Work Plan for the Removal Action at Southwest Trenches, Ra/Sr Treatment Systems, and Domestic Septic System Areas*, (WA, 1998a). RA activities began in May 1998 and were completed by November 1998.

As described in the Work Plan (WP), the first RA task consisted of surface soil characterization sampling followed by excavation and removal of the contaminated soil. Historical site information indicated that chlordane had been used at the site for flea control and had been detected in the shallow soil in the southwest corner of the Site.

Following removal of 450 cubic yards (cu yds) of chlordane-contaminated soil, two exploration techniques (drilling and trenching) were employed to locate the buried waste disposal cells. Data from the exploratory trenching and drilling generated a map showing the locations of approximate boundaries of the waste disposal cells. The findings of the exploratory activities, combined with several factors including limited space for material handling, potential for mixed waste cross-contamination in the southwest corner, and expected dimensions of the disposal cells, were used to develop the waste excavation and removal strategy.

Waste disposal cell excavation activities occurred in three distinct areas: the Northern Excavation Area, the Western Excavation Area, and the Southern Excavation Area. In the Northern Excavation Area, 217 cu yds of waste was removed during the RA. Typical wastes in this area included gravel, syringes, and several glass jars. A total of 466 cu yds of waste was removed from the Western Excavation Area. The western excavations consisted of two parallel 10-12 deep trenches and a smaller shallow disposal pit. The waste in these trenches consisted predominantly of gravel mixed with glass jars, vials, syringes and other laboratory wastes. In the shallow disposal pit (with a depth of five to six feet [ft] below ground surface [bgs]), a 30-gallon crushed drum was recovered. In the Southern Excavation Area, a total of 190 cu yds of waste was removed during the RA. Waste in this area was not commingled with gravel; instead isolated pockets of labware-dominated waste in a soil matrix were discovered. For example, in the upper two ft, waste items consisted of trash such as cans, plastic bags, and Styrofoam cups. However, beneath this layer, a second layer of soil with vials, glass jars containing unknown liquids and solids, and bones was observed.

Backfill and compaction activities commenced following completion of the waste removal activities. Approximately 1,700 cu yds of soil was required for backfilling of the excavations. An off-site source of clean backfill soil was identified, tested, and deemed appropriate for use on site. Excavations were backfilled and compacted in accordance with the WP requirements.

Site restoration activities consisted of paving, installing a fence, and clearing the Site of construction debris and trash. The fencing and drive-gate that had been removed during clearing and grubbing activities were reinstalled.

A two-phased approach was used to determine if the RA objectives (RAOs) were achieved during the 1998 RA. Phase I occurred immediately following the RA while the excavations were open, and was based on screening sample results collected during the RA and analyzed only for "driver constituents of concern (COCs)." Prior to backfilling site excavations, screening analytical results were presented to the RPMs and DOE at a meeting on September 16, 1998 in order to reach consensus on whether cleanup goals were attained for driver COCs. This meeting satisfied the Phase I Data Evaluation objectives as described in the RA WP (WA, 1998a). At the September 16 meeting, a decision was reached to backfill the excavations and to restore the Site.

Phase II Data Evaluation is the subject of this report and was completed after all analytical results from the RA's confirmation sampling were received. The objective of the confirmation sampling was to ensure the attainment of cleanup goals using a statistically-based sampling design. The statistical approach used to determine the required number of confirmation samples and the grid size was in accordance with USEPA guidance (USEPA, 1994). Appendix A of the WP Attachment I included the calculations and statistical formulas used to determine the required number of confirmation samples.

The confirmation samples were collected from the excavation sidewalls and floor to verify that the cleanup criteria for all COCs were met. A total of 63 samples and seven duplicate samples were collected between two and 13 ft bgs. The disposal cell excavation confirmation samples were packaged and shipped to an off-site laboratory analysis of the full set of COCs, consisting of radionuclides, pesticides/PCBs, metals, volatile and semi-volatile organic compounds, and nitrate.

Phase II Data Evaluation consisted of conducting a Risk Analysis, Designated Level Analysis, and RA Completion Analysis. The risk analysis assessed whether the first and second RAOs for the SWT Area RA were attained. The risk analysis consisted of the following:

- Calculating the Reasonable Maximum Exposure (RME) Concentration for each COC;
- Completing a Background Comparison for COCs with Risk-Based Action Standard (RBAS) values less than background;
- Performing a risk analysis for carcinogens and non-carcinogens using the RBAS;
- Comparing RMEs to USEPA Preliminary Remediation Goals (PRGs); and,
- Completing a Hot Measurement Analysis.

This analysis demonstrated that the cumulative residual risk for carcinogens falls within the Comprehensive Environmental Response, Compensation and Liability Act risk range of 10^{-4} to 10^{-6} and only slightly exceeds the 10^{-6} level in Exposure Scenarios 1 and 2 (on-site researcher and east side residential farmer, respectively). Thus, RAO No. 1 has been attained as a result of RA activities by reducing the cumulative cancer risk to a nominal range of 10^{-4} to 10^{-6}.

The cumulative non-carcinogen RME/RBAS ratio for each of the exposure scenarios is below 1.0, the hazard index established as RAO No. 2. Therefore, RAO No. 2 has been attained as a result of RA activities by reducing the non-cancer hazard index to below 1.

All of the non-carcinogenic COCs are below their respective residential PRG values. Five of the carcinogenic COCs (cesium-137 [Cs-137], hexavalent chromium, Co-60, lead-210 [Pb-210], thorium-234) marginally exceed their respective residential PRG values.

The residential PRG scenario was included for comparison purposes only and is highly conservative for the following reasons:

- The USEPA PRG values are typically used only for initial screening of a site's contaminant levels. These values are highly conservative and do not take into account site-specific conditions. During a forward risk assessment, site-specific conditions are used, and the values calculated are typically greater, by as much as an order of magnitude or more, than the USEPA PRG limits;
- Future land use planning by UC Davis does not indicate any possibility of future residential land use at this site. Continued use as a research facility is anticipated for the foreseeable future;

- The risk exposure scenarios were evaluated by calculating site-specific RBAS values at 10^{-4}, 10^{-5}, and 10^{-6} cancer risk, and Hazard Quotient (HQ)=1.0 non-cancer risk. These RBAS values include conservative assumptions, but are more valid due to site-specific information such as depth to ground water and distance to receptors. The USEPA PRG values, on the other hand, are more conservative so that they can be applied at sites throughout the USEPA region with varying characteristics. In this case, PRG values ranged from one to seven orders of magnitude less than the RBAS values for the exposure scenarios; and,
- There were no hot measurement issues with any of the non-carcinogenic COCs and only one concern with carcinogenic COCs: Cs-137 had a single hot measurement location.

The third RAO was to mitigate any potential future impacts to ground water by reducing COC concentrations in soil. To determine whether this objective has been attained, a Designated Level (DL) analysis was conducted.

The DL analysis consisted of three phases:

- Phase A—Preliminary DL Analysis: Evaluate confirmation sampling results and identify DL COCs and hot spot areas;
- Phase B—Data Gaps Investigation: Collect additional vertical profile data, if needed, for each DL COC at the hot spot area; and,
- Phase C—Refined DL Analysis: Model and calculate the DL values which are protective of ground water using the vertical profile of DL COCs.

The Phase A DL analysis consisted of four screening steps: 1) detected versus non-detected analytes, 2) magnitude and frequency comparison with background, 3) chemical and physical properties of detected analytes, and 4) Wilcoxon Rank Sum Test/DL/natural attenuation evaluation. The confirmation sampling results were screened using these screening criteria to determine if any analytes pose a threat to the groundwater beneath the Site.

Five analytes were identified as DL COCs requiring additional evaluation. These analytes include nitrate, mercury, carbon-14 (C-14), Cs-137, and tritium. The Phase B DL analysis – Data Gaps Investigation focused on collecting additional vertical distribution data for the DL COCs. Soil borings were advanced to the water table, soil samples were collected at various depths, and samples were analyzed for one of the five COCs. Soil samples from 40 borings in the southwest portion of the Southwest Trenches were analyzed for nitrate. Six additional borings were located where the highest and second highest activities of C-14, Cs-137, and tritium were detected in confirmation samples, and samples were analyzed for the appropriate COC. The C-14 borings appear to be within the UC Davis Trench Disposal Area instead of the SWT Area, as these areas are defined in the Memorandum of Agreement (MOA), and therefore may not be DOE's responsibility.

These results were used in Phase C, Refined DL Analysis. Based on the three phases of DL analysis, Cs-137 in the Southwest Trenches presents no threat to ground water. Any ground water impact resulting from mercury and tritium in Southwest Trenches soil would likely be very localized and well below maximum contaminant levels (MCLs).

Based on the DL analysis, nitrate in Southwest Trench soil may locally impact ground water above background and/or the MCL, but the impact is likely insignificant on a site-wide or regional scale. The DL analysis is a conservative estimation of potential future ground water impact and is expected to overestimate actual impacts. To put the potential nitrate impact into perspective, the total nitrate as nitrogen above background in the SWT Area is estimated at only 950 pounds, compared to: a) 1,100 pounds nitrate as nitrogen in one acre of vadose zone soil at the average background concentration; b) an estimated 17,000 pounds nitrate as nitrogen potentially reaching ground water annually from normal agricultural practices in the immediate vicinity of LEHR (Dames & Moore, 1990); and, c) an estimated 36,500 pounds nitrate as nitrogen historically discharged annually to Putah Creek from the UC Davis outfall (Dames & Moore, 1990).

Based on the DL analysis, C-14 in the DL boring located at the southeast edge of the SWT Area, apparently within the UC Davis Trench Disposal Area, may locally impact ground water above background and/or the MCL. However, the DL analysis is expected to overestimate actual impacts, as mentioned above. This is demonstrated by the C-14 activity measured in ground water from well UCD1-23, the closest well downgradient of the DL boring, which was approximately an order of magnitude less than the 2,000 pCi/L MCL in samples collected prior to the RA in 1998. Since the RA in 1998, C-14 activities in this well have decreased to below the 20 pCi/L detection limit.

RA completion analysis was finally performed to determine whether RAOs had been met. Each RAO attainment is presented below.

RAO 1—Reduce Cancer Risk

The first RAO was to reduce the excess cumulative cancer risk from the site to the nominal range of 10^{-4} to 10^{-6} using 10^{-6} as the point of departure. As discussed in Section 6.2.6.1, the cancer risk for all three scenarios is below 10^{-5}. In addition, excess risk for Scenario 3 is below 10^{-6}. Excess cancer risks for Scenarios 1 and 2 are 1.44×10^{-6} and 1.45×10^{-6}, respectively, which only marginally exceed 10^{-6}. Therefore, this objective has been attained.

RAO 2—Reduce Non-Cancer Hazard Quotient

The second RAO is to reduce the cumulative non-cancer HQ below 1.0. The HQs for Scenarios 1, 2, and 3 were less than 1; therefore, this objective has been obtained.

RAO 3—Mitigate Ground Water Impact

The third RAO was to mitigate any potential future impacts on ground water associated with residual soil concentrations. The RA removed most of the contaminant mass in the SWT area; therefore, the RAO of reducing potential future impacts to ground water was likely met. Based on the DL analysis, only nitrate in Southwest Trenches soil may impact local ground water above

MCLs. Mercury and tritium in soil may result in localized impact above background, but below MCLs. Because the remaining impacted Southwest Trenches soil is localized and the DL modeling is very conservative, these potential ground water impacts are likely insignificant. Furthermore, the potential SWT Area nitrate contribution to ground water is insignificant compared to agricultural and other nitrate sources in the area.

RAO 4—Mitigate Ecological Risk

The fourth RAO was to mitigate potential ecological risks. No ecological risk screening has been performed at the site. Hence, no ecological risk-based screening standards are available for comparison and evaluation of this RAO. However, one can use the human health risk as a benchmark for estimating the likelihood of mitigating risk to the environment. Since the RA achieves the human health risk standards, which are very conservative, it is likely that ecological risks were also mitigated. Attainment of this RAO, however, will be determined when a site-wide ecological risk analysis is performed.

RAO 5—Minimize Disruption to University Research

The fifth RAO was to minimize disruption to University research activities while conducting the RA. The RA implemented at the Southwest Trenches during the summer of 1998 did not disrupt any University research and therefore this objective has been attained.

1. INTRODUCTION

This report presents the results of the non-time-critical Removal Action (RA) conducted at the Southwest Trenches Area (SWT Area) located at the Laboratory for Energy-Related Health Research (LEHR), University of California, Davis (UC Davis), California. This RA Confirmation Report includes the Phase II data evaluation described in the RA Work Plan (WA, 1998a). The RA was implemented in accordance with the National Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Part 300.415. This report is written in accordance with the section on On-Scene Coordinator (OSC) Reports in *"Superfund Removal Procedures, Removal Response Reporting: POLREPS and OSC Reports"* United States Environmental Protection Agency (USEPA) Publication 9360.3-03, June 1994. This report was prepared by Weiss Associates (WA) under Department of Energy (DOE) Environmental Restoration/Waste Management (ER/WM) Contract No. DE-AC03-96SF20686.

Section 1.1 discusses Site background including historical and current uses of the area, conditions prior to start of the RA, and constituents of concern (COCs). The RA objectives (RAOs) are presented in Section 1.2, and report organization is described in Section 1.3.

1.1 Site Background

The SWT Area is located in the southwest corner of the LEHR Facility as shown in Figure 1-1. The SWT Area is relatively flat, unpaved, and occupies approximately one-half of an acre (22,000 square feet [ft]) at the LEHR facility. The depth to ground water at the site varies from 20 to 45 ft below ground surface (bgs) between winter and summer months, respectively, as influenced by agricultural demand.

Between the late 1950s and early 1970s, LEHR-generated low-level radioactive waste, fecal material, and laboratory wastes were reportedly disposed in shallow pits and trenches at the SWT Area (Dames & Moore, 1993). In this report, these pits and trenches are referred to as "waste disposal cells." The exact locations, dimensions and orientation of these disposal cells were not known with certainty prior to the RA. Disposal practices consisted of excavating a trench and placing laboratory waste along with gravel and soil in the trenches. The trenches were then backfilled with the native soil. In addition, part of the SWT Area was used for treating dogs with chlordane as flea control. Specifically, a storage shed in the southwest corner of the SWT Area apparently contained chlordane, and dogs were treated with chlordane nearby. The waste disposal cells and surface soil contamination associated with chlordane usage are the subjects of this RA.

Currently, DOE has no present or future plans for the SWT Area aside from ER/WM activities. Upon completion of environmental restoration activities, the SWT Area will be transferred to UC Davis, as described in an MOA established between DOE and UC Davis in 1997.

The COCs at the SWT Area were identified during previous environmental investigations. Constituents detected above background were considered to be COCs. Additional information regarding background and previous investigations performed at the SWT Area may be found in:

- *Final Engineering Evaluation/Cost Analysis (EE/CA) Report* (WA, 1998b); and,
- *Draft Final Site Characterization Summary Report* (WA, 1997a).

Several COCs were either consistently detected at the SWT Area or were associated with past operations and releases to the environment. These COCs were considered "driver COCs" and their concentrations were used during the RA to guide the excavation activities. The driver COCs at the SWT Area include radium-226 (Ra-226), strontium-90 (Sr-90), chlordane, hexavalent chromium, nitrate, and mercury.

1.2 Removal Action Objectives

The objectives of the RA were defined in the EE/CA as follows:

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

As discussed in the Work Plan (WP), two phases of data evaluation were performed for the RA to determine attainment of the RAOs above. Figure 1-2 presents a chronology of the RA and data evaluation phases. Phase I occurred immediately following the RA and was based on field screening sample results. Phase II is presented in this report and is based on confirmation sample results. Figure 1-3 presents a decision flow diagram for the Phase II data evaluation discussed in more detail in Section 6.

1.3 Report Organization

This report documents the RA activities performed at the SWT Area, presents the analytical results of the sampling performed, and provides an evaluation of whether RAOs have been achieved. Section 2 presents a summary of the RA activities including soil excavation, waste disposal cell exploration, waste removal and sorting, backfilling of excavations, and final Site restoration. Section 3 presents the waste management activities performed from the moment wastes were generated through packaging, storage and disposal. Section 4 summarizes the health and safety activities performed during the RA. Section 5 presents the sampling activities and analytical results generated as a result of the RA. Section 6 contains the Phase II data evaluation including statistical evaluation, risk analysis and DL analysis. Finally, Section 7 evaluates whether the RAOs were attained.

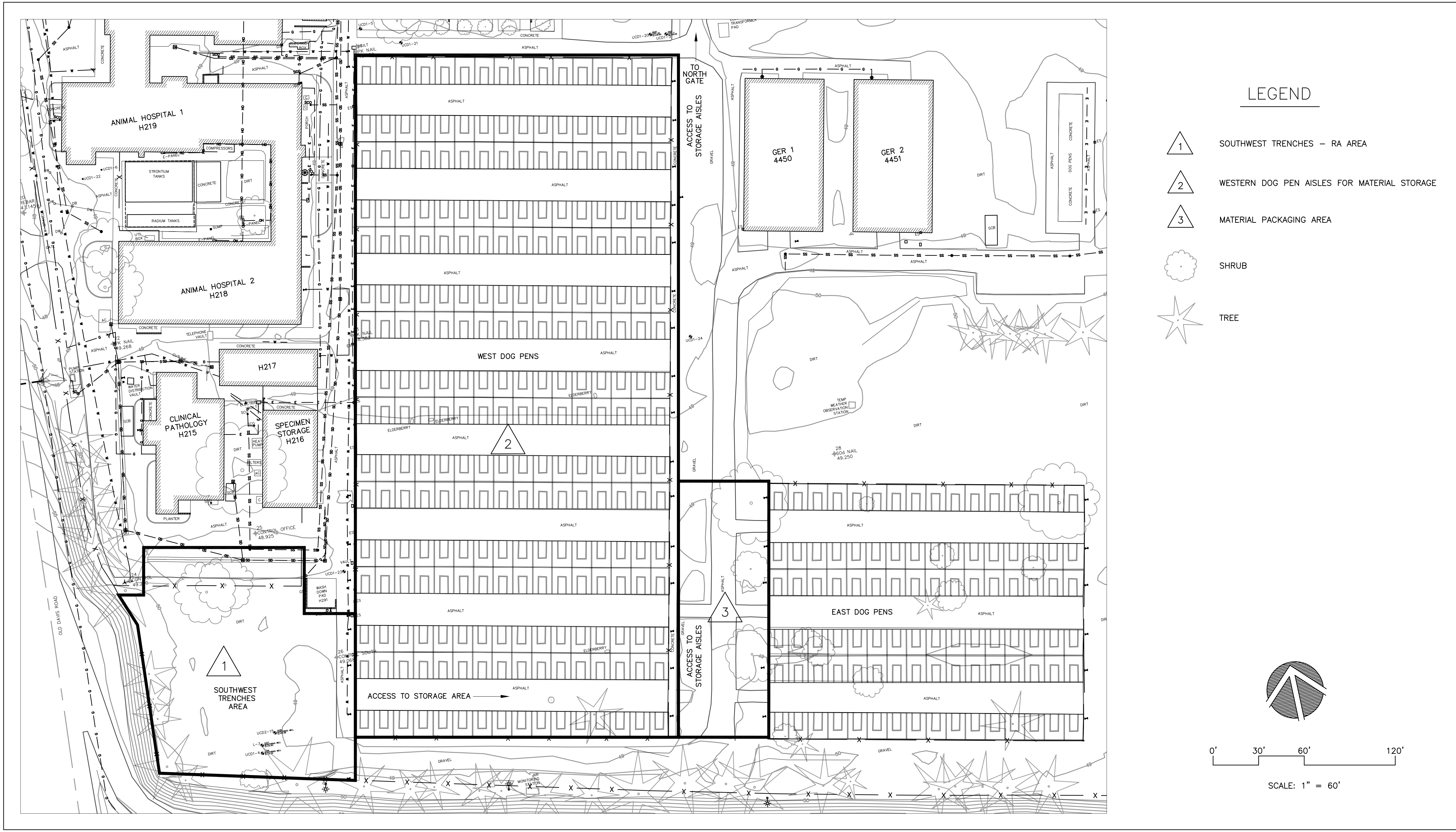

FIGURE 1-1. SOUTHWEST TRENCHES REMOVAL ACTION AND SUPPORT AREAS, LEHR, UC DAVIS, CALIFORNIA

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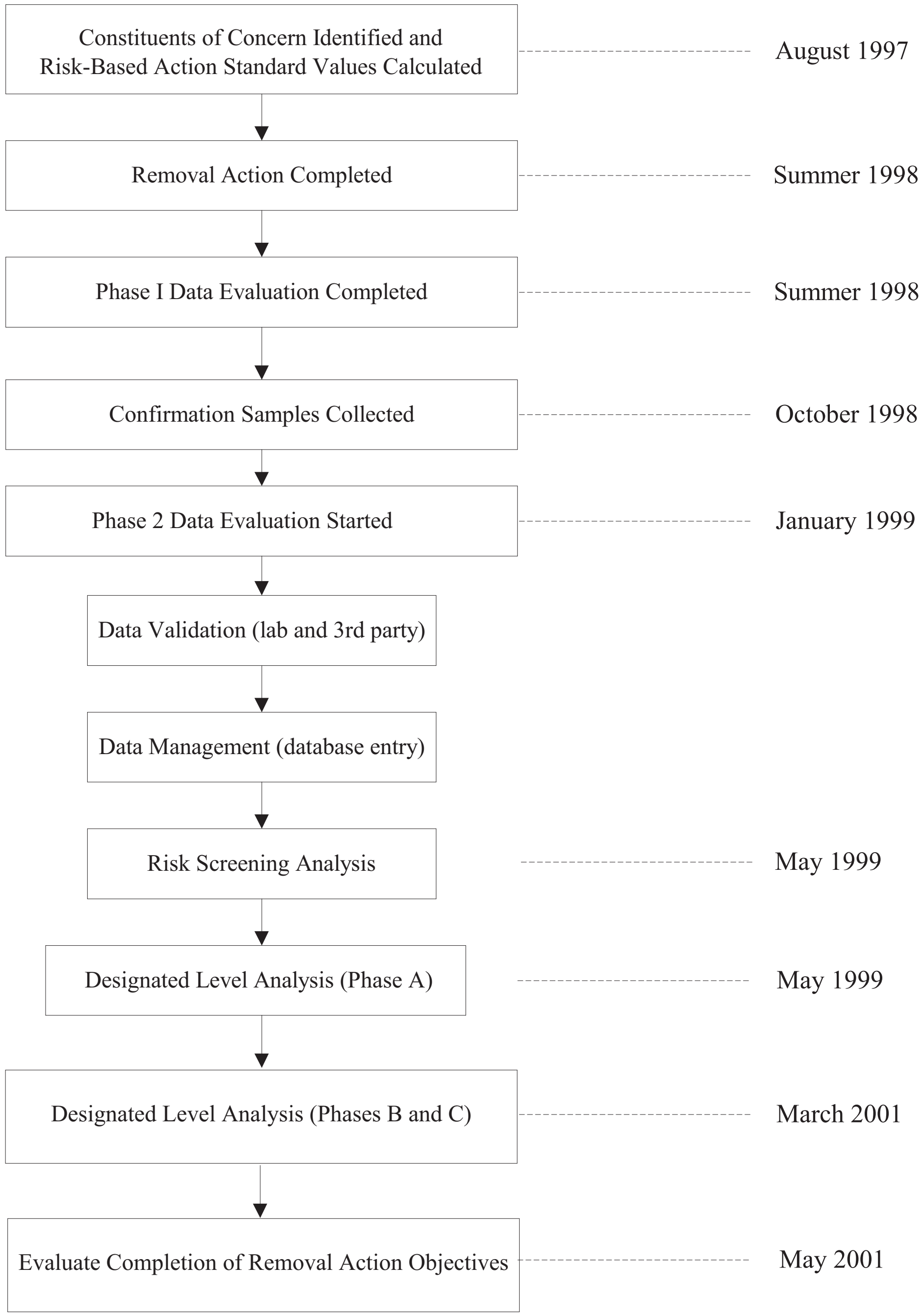

Figure 1-2. LEHR Southwest Trenches Removal Action Chronology and Data Evaluation Process
LEHR, UC Davis, California

Weiss Associates

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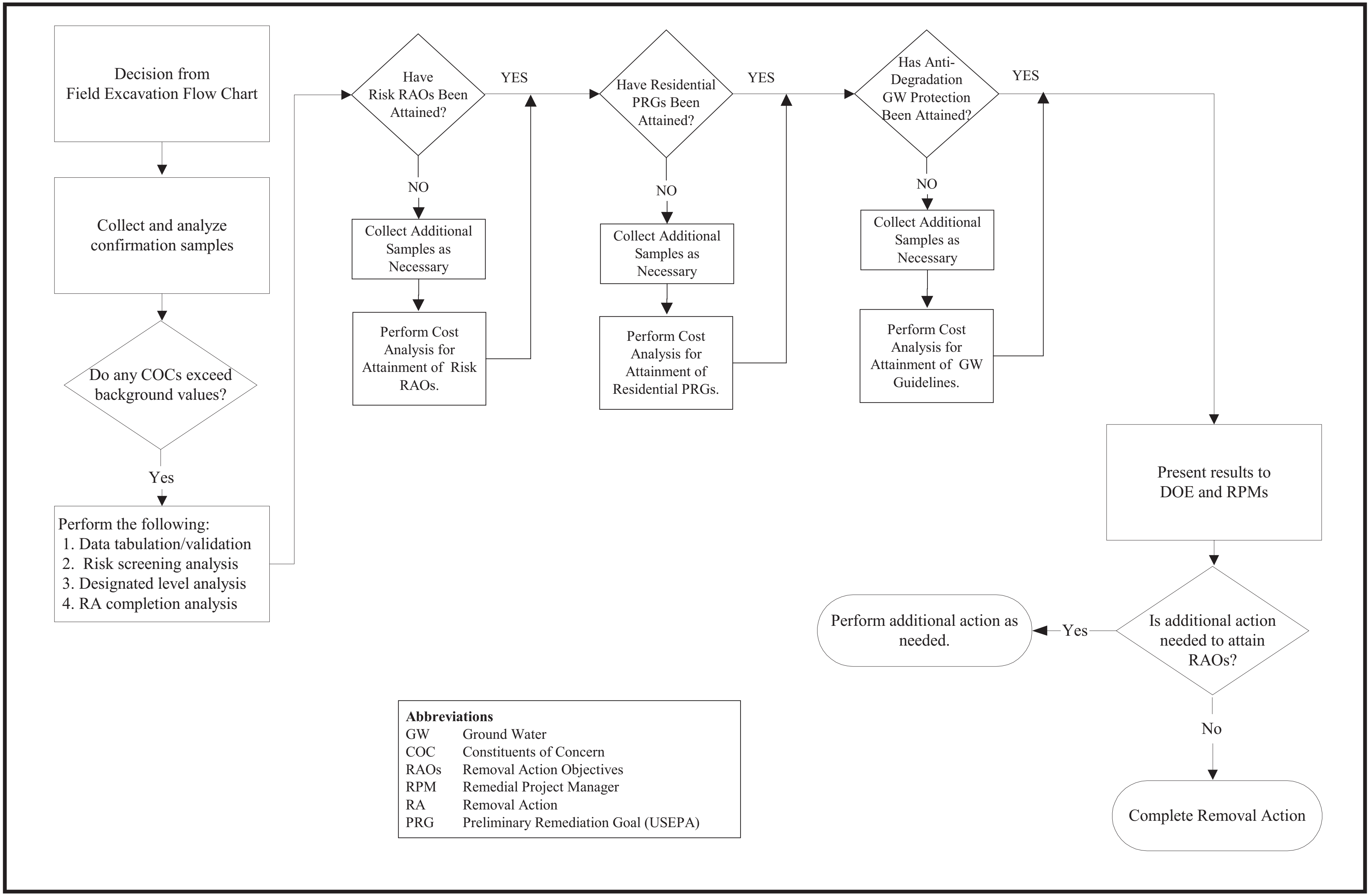

Figure 1-3. Southwest Trenches Area Removal Action Phase 2 Data Evaluation, LEHR, UC Davis, California

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2. REMOVAL ACTION ACTIVITIES

The RA at the SWT Area was conducted in accordance with the *Draft Final Work Plan for the Removal Action at Southwest Trenches, Ra/Sr Treatment Systems, and Domestic Septic System Areas*, (WA, 1998a). The RA was implemented in accordance with the NCP, 40 CFR Part 300.415. RA activities began in May 1998 and were completed by November 1998.

2.1 Mobilization and Site Setup

WA and its subcontractor, IT Corporation, mobilized to the site in May 1998 to begin the RA. Site setup activities consisted of mobilizing equipment and personnel to the SWT Area; clearing and grubbing of the area; establishing the work area, storage area, and the on-site laboratory; clearing the Western Dog Pen aisles for waste storage; and conducting a utility survey of the SWT Area. Figure 1-1 shows the SWT Area and RA support areas.

Clearing and grubbing activities consisted of cutting and removing two trees located north of the SWT Area, dismantling the fencing and drive-gate located along the paved parking lot to the north, cutting and removing a section of the pavement associated with the parking lot to the north, and clearing the surface of the SWT Area of vegetation and debris. Upon completion of clearing activities, the SWT Area was secured by erecting a 6-ft high chain link fence around the SWT Area and portions of the Western Dog Pens. Gates were installed for vehicle access at several locations along the fence. The fencing surrounding the SWT Area was covered with a mesh screen to mitigate dust migration.

Animal Hospital No. 1 was used for storage of construction-, sampling-, and health and safety-related supplies. In addition, part of the building was converted into an on-site analytical laboratory. Pacific Northwest National Laboratory contracted with DOE to provide on-site analytical instrumentation and technician support for Ra-226, cesium-137 (Cs-137) and Sr-90 analysis.

The Western Dog Pen aisles were cleared of physical barriers such as fence posts, solid wastes stored there from previous demolition activities including fencing and posts, and other debris. An area between the Western and Eastern Dog Pens was paved to provide a flat and stable surface for waste sorting and packaging activities.

As part of the setup activities, a 10 ft by 10 ft grid system was established that was used throughout the RA as the horizontal coordinate reference system for marking and locating objects in the field. The origin of the grid system was located at the northeast corner of the SWT Area. The north-south grids were labeled with an “S” and numerically increased from “0” to “15” from north to south. Similarly, the east-west grids were labeled with a “W” and increased from “0” to “15” from east to west. For example, W8S8 meant a location within the SWT Area that was 80 ft to the east and 80 ft to the south of the origin. The grid system is shown in Figure 2-1.

2.2 Chlordane-Impacted Soil Removal

As described in the WP, the first RA task consisted of surface soil characterization sampling followed by excavation and removal of the contaminated soil. Historical site information indicated that chlordane had been used at the site for flea control and had been detected in the shallow soil in the southwest corner of the SWT Area. Chlordane characterization and excavation activities are described in the following section.

2.2.1 Characterization Activities

Soil characterization sampling activities consisted of collecting samples across the SWT Area and analyzing them. Section 5 presents a detailed discussion of this activity and the analytical results of the sampling. Four chlordane "hot spots" were identified at the SWT Area. Hot spots were defined as areas where chlordane concentration in soil was elevated relative to adjacent areas. The area around each "hot spot" was further sampled to better define the lateral and vertical extent of the chlordane in soil.

2.2.2 Excavation Activities

Based on chlordane characterization sampling results, an excavation boundary was defined at the 10^{-6} Risk-Based Action Standard (RBAS) around each hot spot. An excavator removed contaminated soil to the limits shown in Figure 2-1. Excavated soil was placed in a front-end loader and transported to the Western Dog Pen aisles for stockpiling. A total of 450 cubic yards (cu yds) of soil were transported to the Western Dog Pens for storage. Section 3 discusses waste handling and management activities.

Following excavation, confirmation samples were collected and analyzed for chlordane to ensure attainment of the cleanup levels. Section 5 presents the results of the confirmation sampling.

2.3 Waste Disposal Cell Exploration Activities

As described in the WP, limited information was available on the location and orientation of the buried waste disposal cells. Following removal of the chlordane-contaminated soil, two techniques were used to locate buried waste. First, a backhoe was used to trench along the grid lines throughout the SWT Area ("Grid Trenching"). Then, a direct-push drilling rig was used to collect samples in the chlordane excavation area to define the lateral and vertical extent of two waste disposal cells. This task was called "Grid Drilling" and was an addition to the Work Plan which had specified that trenching would be the only exploratory technique used. Direct push drilling was selected to define the waste limits because it is a less intrusive technique and mitigated potential cross contamination in the chlordane-impacted area. Each exploratory activity is described in more detail below.

2.3.1 Grid Trenching

Grid trenching began in the northern portion of the Site and proceeded in a southerly direction. First, trenches were excavated along the east-west gridlines and then along the north-south gridlines. Trenches were typically 24 to 30 inches wide and terminated approximately six ft bgs. If waste was encountered along the trench (either vertically or horizontally), its location was marked on a drawing, surveyed in the field, and then the trench was backfilled. Figure 2-2 shows the grid trenching activities. It should be noted that no waste was removed during exploratory trenching activities except in the southern portion of the site where a laboratory vial containing liquid was removed to avoid breaking during tritium excavation.

Trench spoils were placed along the side of the excavation and each bucket of soil was tested as it was removed from the ground using a 2x2 sodium-iodide (NaI) detector and a Geiger-Muller (GM) probe. Upon completion of each gridline, the trench was backfilled with trench spoils removed from that location and compacted in 8-inch loose lifts. A remote-controlled sheepsfoot roller was used for compaction. A nuclear density gauge was also used to determine the in-place density of each lift and ensure attainment of the required 85% compaction of maximum dry density of the soil.

2.3.2 Grid Drilling

Since chlordane was detected in the soil overlying two suspected waste disposal cells (Figure 2-2), the potential existed for a mixed-waste (i.e., low-level radioactive waste *mixed* with Resource Conservation and Recovery Act [RCRA] hazardous waste) to be present in the waste matrix. In order to minimize cross-contamination and to better define the extent of the waste disposal cells, an EnviroCore direct-push drilling system was mobilized to the SWT Area. The grid spacing was reduced to five ft within the chlordane excavation and borings were advanced along the gridlines to locate the lateral and vertical boundaries of the two waste disposal cells. Figure 2-2 shows grid-drilling locations at the SWT Area.

Each borehole was continuously logged to record the changing lithology and mark the depth at which waste was encountered or terminated. Soil samples were also collected from the waste disposal cells and analyzed for chlordane to determine if the waste matrix would be classified as mixed-waste. Section 5 presents the results of this sampling.

2.4 Waste Removal

Data from the exploratory trenching and drilling was used to generate a map showing the locations of approximate boundaries of the waste disposal cells. The findings of the exploratory activities, combined with several factors including limited space for material handling, potential for mixed waste cross-contamination in the southwest corner, and expected dimensions of the disposal cells, were used to develop the following waste excavation and removal strategy:

- Excavation began in the north and proceed to the south;
- The top two to four ft of soil were considered overburden (free of waste) and removed;
- Waste removal proceeded laterally in 10- to 15-ft segments;
- Waste Packaging Observers (WPOs) examined each backhoe bucket of waste removed from the ground and surveyed the content using the NaI detector and the GM probe and survey meter;
- The WPO recorded the content of each excavated bucket and if necessary, waste items were segregated according to the *Technical Guidance Document for Waste Segregation at Southwest Trenches Area* (WA, 1998e);
- An additional 6 to 12 inches of soil were removed in all directions once the final extent of the waste disposal cell was reached; and,
- Soil samples were collected from the sidewalls and floor of the excavation and analyzed immediately to determine whether cleanup goals had been attained.

Waste sorting and handling activities are described in Section 3.

The following section describes the waste disposal cell excavation activities for three distinct areas: the Northern Excavation Area, the Western Excavation Area, and the Southern Excavation Area. Figure 2-3 shows the boundaries of each excavation area along with the approximate depths and volumes of waste removed from each disposal cell. In addition to these areas, a portion of the SWT Area consisting of surface gravel and subsurface cobble trenches, which were discovered during grid trenching, is also discussed in this section.

2.4.1 Northern Excavation Area

In the Northern Excavation Area, 217 cu yds of waste was removed during the RA. Three trench-shaped disposal cells were identified in this area as shown in Figure 2-3. Typical wastes in these trenches included gravel, syringes, and several glass jars. Figure 2-4 presents the locations within the disposal trenches where waste items were more concentrated.

2.4.2 Western Excavation Area

A total of 466 cu yds of waste was removed from the Western Excavation Area. The western excavations consisted of two parallel 10-12 deep trenches and a smaller shallow disposal pit located along grid line S8 (Figure 2-4). The two longer trenches were referred to as trench “W8” and “W10” based on their orientation relative to grid lines W8 and W10. The waste in these trenches consisted predominantly of gravel mixed with glass jars, vials, syringes and other laboratory wastes. In trench W8, several animal bones were encountered. In the shallow disposal pit (with a depth of five to six ft bgs), a 30-gallon crushed drum was recovered. The drum appeared to be empty. Figure 2-4 shows the locations where laboratory waste items were encountered at a higher frequency in the Western Excavation Area.

2.4.3 Southern Excavation Area

In the Southern Excavation Area, a total of 190 cu yds of waste was removed during the RA. Waste in this area was not commingled with gravel; instead isolated pockets of labware-dominated waste in a soil matrix were discovered. For example, in the upper two ft, waste items consisted of trash such as cans, plastic bags, and Styrofoam cups. However, beneath this layer, a second layer of soil with vials, glass jars containing unknown liquids and solids, and bones was observed. Figure 2-4 shows the locations of the waste items encountered within this area.

2.4.4 Cobble/Gravel Area

In the northeastern portion of the site, a near-surface layer of gravel, approximately 18 inches deep, was observed during the exploratory trenching. No waste items were noted in this gravel. Samples from the soil immediately beneath the gravel were analyzed for pesticides/PCBs, metals, radionuclides, hexavalent chromium, and nitrate. Sampling results are discussed in Section 5.

Subsurface cobble trenches were also noted in the eastern portion of the site. The cobbles measured two to three inches in diameter and appeared to represent a drainage structure. The top of the cobble trench was approximately 18 inches bgs and measured one to two ft in width and depth. No waste items were observed in the cobble trench. However, samples were collected of the cobbles and the soil beneath the cobble trenches and analyzed for the driver COCs. Analytical results are discussed in Section 5.

2.5 Backfill and Compaction

Prior to backfilling the excavations, screening analytical results were presented to the RPMs and DOE at a meeting on September 16, 1998 in order to reach consensus on whether cleanup goals were attained for driver COCs. This meeting satisfied the Phase I Data Evaluation objectives as described in the RA Work Plan (WA, 1998a). Except for nitrate and mercury, screening results showed that cleanup goals were attained for all other driver COCs. At the September 16 meeting, a decision was reached to backfill the excavations and restore the SWT Area. In addition, prior to backfilling, it was decided that confirmation samples would be collected from the sidewalls and floors of the excavations and analyzed for the full suite of COCs. Sampling activities and analytical results are discussed in Section 5.

Two sources of material were evaluated for backfilling of the excavations: 1) the on-site overburden soil, excavated during the RA and stockpiled on-site for potential use as backfill, and 2) imported backfill. To determine the suitability/acceptability of each backfill material, representative samples were collected and tested for specific chemical, radiochemical and physical parameters.

Approximately 435 cu yds (*ex-situ* volume) of soil was removed from the SWT Area and stockpiled in the Western Dog Pens during the RA. This soil, referred to as "overburden soil," was excavated from depths of zero to 3.5 ft bgs. To confirm that the overburden soil was not contaminated by previous waste disposal practices, the stockpiled soil was sampled and tested for the full suite of COCs according to the workplan. Sampling results are presented in Appendix A. Based on a preliminary review of the analytical results, the overburden soil was deemed unsuitable for use as backfill due to the presence of mercury above background.

Approximately 1,700 cu yds of soil was required for backfilling of the excavations. An off-site source of clean backfill soil was identified in the West Sacramento area. The soil vendor (Copper Enterprises), indicated that the material originated from a location near the LEHR Facility and had been used for levee construction by the US Army Corps of Engineers in the 1960s in the Sacramento area. The subject material consists of the upper portions (4 to 12 inch depth) of the levee which was recently removed during recent levee refurbishment.

Ten representative samples were collected from the soil pile and analyzed for the full suite of COCs. All ten samples were analyzed using the USEPA Solid Waste-846 methods for metals, pesticides/PCBs, hexavalent chromium, and nitrate. An additional sample was also collected and analyzed for volatile and semi-volatile organic compounds (VOCs and SVOCs), metals, pesticides/PCBs, and radionuclides using the USEPA Contract Laboratory Program methods. The on-site gamma spectrometer and beta scintillation detector were also used to analyze 30 soil samples from the import stockpile for Ra-226, Cs-137, and Sr-90. Based on the analytical results, the imported fill material did not contain COCs at concentrations significantly above background or RBASs, and was therefore deemed suitable for use as backfill at the SWT Area. In addition, the material exhibited an average permeability of 7.7×10^{-5} cm/sec as measured by ASTM Method D-5084-90, at a compaction of 86 percent of maximum dry density.

Prior to the start of backfilling, a professional land survey crew surveyed the locations of the excavation boundaries and confirmation sample locations. The excavations were then cleared of loose material and a 4-ounce per square yard permeable geotextile fabric was placed at the bottom and along the sides of the excavations to mark the extent of the waste excavations. Backfill soil was placed in 8-inch loose lifts and compacted to the required minimum of 85% compaction in the unpaved areas and 90% compaction in the paved areas. In-place field density and moisture content were determined using a portable nuclear density/moisture gauge. One hundred and two field in-place density tests were performed with an average in-place density of 94% of the maximum dry density.

2.6 Site Restoration and Demobilization

Site restoration activities consisted of paving, installing a fence, and clearing the SWT Area of construction debris and trash. The northern section of the SWT Area, where an area measuring approximately 120 ft long by 20 ft wide had been disturbed, was repaired and repaved. The pavement construction consisted of six inches of sub-base rock and three inches of asphalt.

The fencing and gate that had been removed during clearing and grubbing activities were reinstalled. Finally, all equipment and personnel from the SWT Area were demobilized upon completion of the RA.

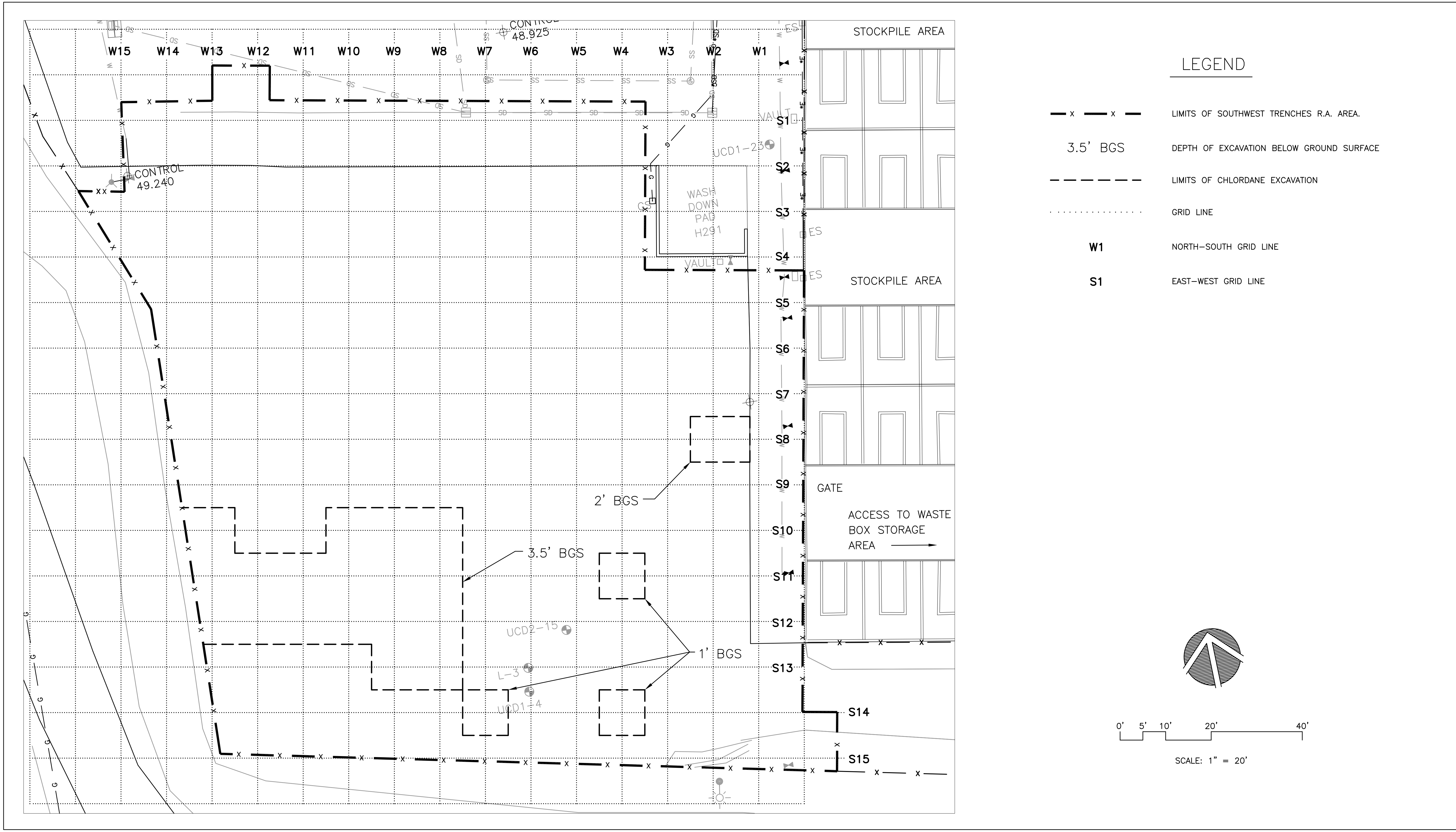


FIGURE 2-1. OPERATIONAL GRID SYSTEM AND FINAL CHLORDANE EXCAVATION BOUNDARIES, LEHR SOUTHWEST TRENCHES AREA, UC DAVIS, CALIFORNIA

WEISS ASSOCIATES

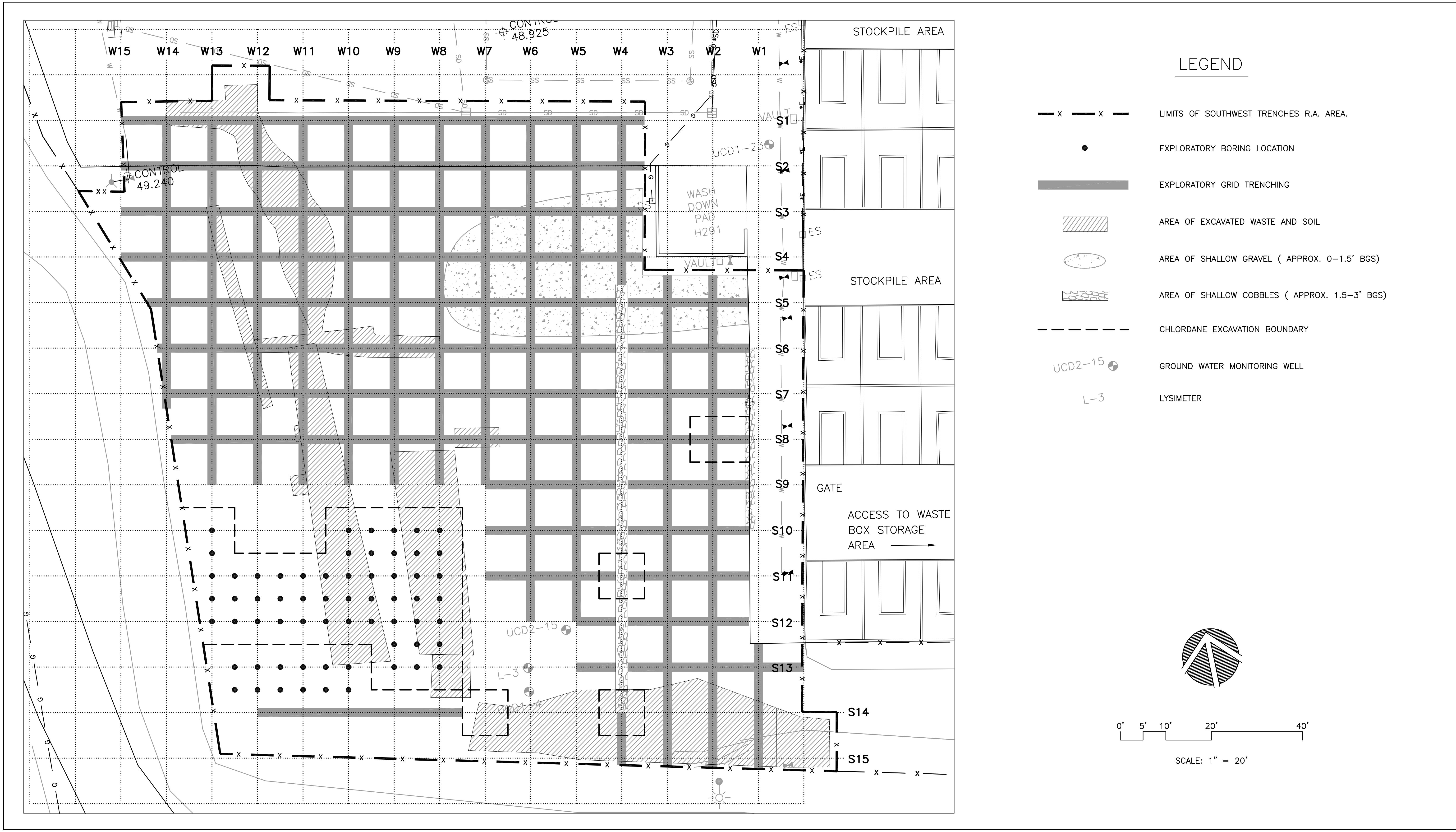


FIGURE 2-2. AREAS OF EXPLORATORY TRENCHING AND DRILLING, LEHR SOUTHWEST TRENCHES AREA, UC DAVIS, CALIFORNIA

WEISS ASSOCIATES

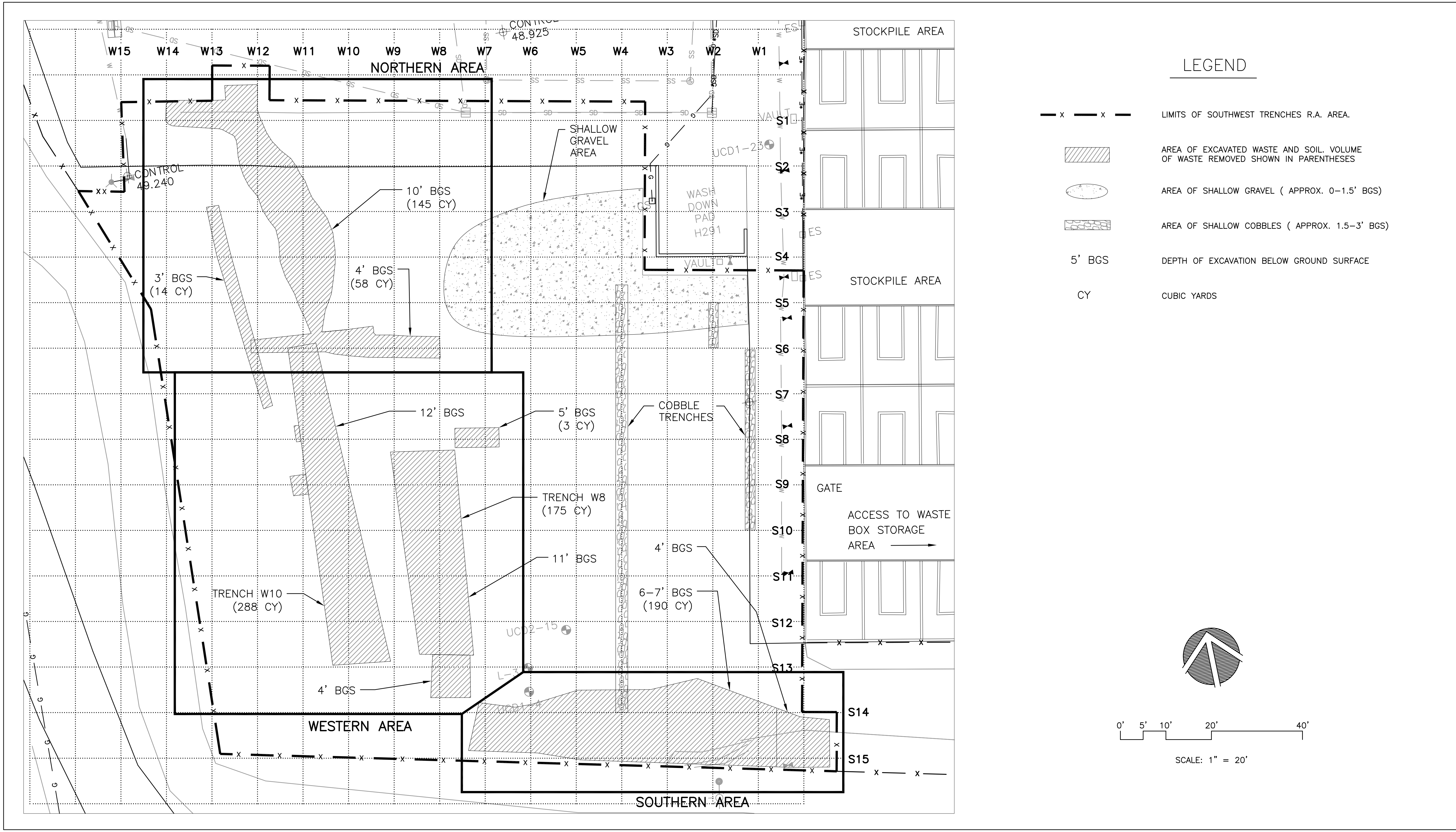


FIGURE 2-3. WASTE DISPOSAL CELL EXCAVATION DEPTHS AND VOLUMES, LEHR SOUTHWEST TRENCHES AREA, UC DAVIS, CALIFORNIA

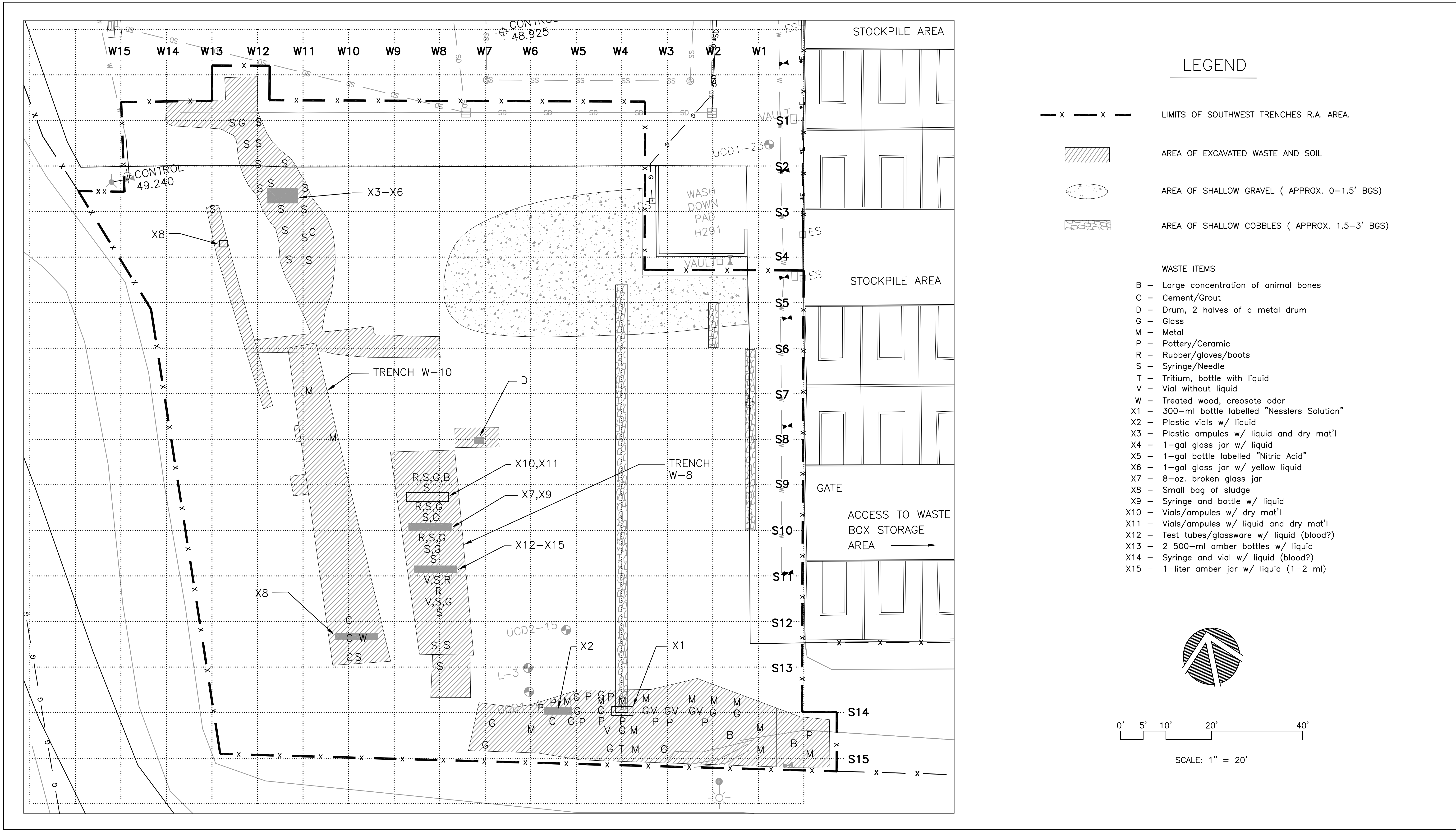


FIGURE 2-4. LOCATIONS AND TYPES OF WASTE ITEMS REMOVED FROM DISPOSAL CELLS

WEISS ASSOCIATES

3. WASTE MANAGEMENT ACTIVITIES

This section presents the waste management activities performed at the SWT Area during the RA. Waste management activities commenced with the excavation of the waste and will conclude with disposal at appropriate disposal facilities. During the RA, waste consisting of soil and gravel, laboratory-related debris, liquids, and miscellaneous solid waste such as personal protective equipment (PPE) and RA-related construction debris was excavated. Each waste stream was managed based on its origin, characteristic, and expected classification. The following section discusses the characterization, handling and packaging, and final disposition options of each waste stream.

3.1 Chlordane-Impacted Soil

Following delineation of the surface soil, excavation activities began to remove chlordane-impacted soil. This soil was removed from four distinct areas at the SWT Area (Figure 2-2) and transported to the Western Dog Pens where it was placed on a 20-mil high density polyethylene (HDPE) liner and covered with the HDPE. Four individual stockpiles were created with a combined volume of 350 cu yds.

3.1.1 Characterization

Samples were collected from each stockpile to determine its characteristic and determine the proper disposal option. Appendix A presents the results of the chlordane stockpile characterization sampling. Because the soil was removed from a Radioactive Materials Management Area (RMMA), the soil was assumed to contain radioactive materials until analytical data were validated and the waste could be properly designated. Therefore, the material was managed as potentially mixed waste.

3.1.2 Storage

Chlordane-impacted soil is stored within wrapped stockpiles. The stockpiles were designed such that rainfall would not infiltrate the pile or pond on the piles. Lumber (2” x 4”) and nails were used to secure the top and bottom liners against wind and rainfall. The storage area is secured and posted in accordance with the LEHR Standard Operating Procedures (SOPs) 34.2, Low-Level Radioactive Waste Storage, and 34.4, Clean Waste Handling, and applicable regulatory standards.

3.1.3 Disposal

Based on preliminary analytical results, it appears that most of the chlordane-impacted soil will be designated as a characteristic RCRA hazardous waste and will be treated at a RCRA treatment storage and disposal facility prior to off-site disposal. The remaining small quantity of non-hazardous soil exceeding RBAS levels is likely to be disposed at a USEPA-approved non-RCRA disposal facility.

3.2 Disposal Cell Wastes

Low-level waste excavated from the disposal cells was placed in steel B-25 box containers and transported to the Western Dog Pen aisles for temporary storage. The B-25 boxes were obtained from two DOE facilities, Savannah River and GTS-Duratek, and were manufactured by Container Products Corporation. Because the surplus boxes were previously used, refurbishing activities included sanding, removing rust, removing old decals, and painting. The boxes were then transported to the paved aisles of the Western Dog Pens.

Two different types of B-25 boxes were utilized for packaging waste. Either a 14-gauge or a 12-gauge carbon steel-frame box type was used for low-level waste packaging. The 14-gauge box design was called the “light box,” since its equivalent maximum payload capacity was up to 7,000 pounds (tare weight of 460 pounds). The 12-gauge box design was called the “heavy box,” since its equivalent maximum payload capacity was up to 11,000 pounds (tare weight of 575 pounds). Both B-25 box types have an approximate external volume of 96 cubic ft.

The wastes removed from the disposal cells consisted of (1) gravel and soil commingled with (2) laboratory-related solid waste such as syringes, vials, glass bottles and jars, and ceramic crucibles. Other waste items included animal bones and remains. Typical waste items removed from the disposal cells are shown in Figure 2-4 and discussed in Section 2. Lab waste items such as vials, glass jars and bottles that were intact and contained residual liquid or solid matter were manually segregated from the soil/debris waste stream and were stored in poly-buckets. The lab waste is collectively referred to as the “lab pack” waste and consists of 15, 5-gallon buckets.

3.2.1 Characterization

The soil and gravel waste stream removed from the disposal cells was sampled as it was being placed in B-25 boxes. Samples were collected at a frequency of one four-point composite sample per 50 cu yds of waste. Appendix A presents the sampling procedures and analytical results for this waste characterization activity.

The lab pack wastes have yet to be characterized. At present, a workplan is being developed to segregate and combine the materials into chemically compatible mixtures. After this is accomplished, a sampling plan will be developed to properly characterize the contents of these bulked waste packages for disposal. Because the materials originated from an RMMA, they are being managed as a potentially mixed waste.

3.2.2 Storage

The B-25 boxes were moved to the Western Dog Pens Area where they were properly labeled and sealed. Each waste package was logged into the LEHR Waste Tracking System as described in SOP 34.5, Waste Tracking System and in the Waste Management Plan.

The lab pack waste is stored within sealed poly-buckets in Geriatrics Building No. 1. All waste packages were logged into the LEHR Waste Tracking System. The lab pack waste is being managed as potentially mixed waste.

The storage area is secured and posted in accordance with the Technical Guidance Document for Waste Management (WA, 1999b), the Radiological Protection Program (RPP) and LEHR SOPs 34.2, Low-Level Radioactive Waste Storage, and 34.4, Clean Waste Handling.

3.2.3 Disposal

A set of B-25 boxes that was profiled and designated as low-level radioactive waste was shipped and disposed at Envirocare of Utah and a USEPA-approved facility. A total of 79 boxes have been disposed as of the date of this report. The remaining B-25 boxes are currently being designated for disposal. Disposal of these boxes is scheduled to be complete by December 31, 2000.

3.3 Overburden Soil

Overburden soil was also excavated during waste removal activities. The top zero to 3.5 ft of soil at the SWT Area was removed over an area of approximately 150 ft by 60 ft. Approximately 435 cu yds of soil were transported to the Western Dog pen aisles and stockpiled in HDPE cells. This overburden contained minimal amounts of contaminants that were less than the federal and state hazardous waste characteristic levels. Since Land Disposal Restriction (LDR) requirements apply only to hazardous wastes, stockpiling of this overburden material was not subject to LDR.

3.3.1 Characterization

The overburden soil was sampled to determine if it was suitable for use as backfill following completion of excavation activities (WA, 1998d). The characterization results are presented in Appendix A.

3.3.2 Storage

Overburden soil stockpiles were constructed in the same manner as the chlordane-impacted soil stockpiles. Overburden soil stockpiles are located within the Western Dog Pen aisles.

3.3.3 Disposal

Based on preliminary data, it is assumed that approximately 335 cu yds of the 435 cu yds of the overburden soil will be classified as non-hazardous material with concentrations less than the RBAS. We plan to use this non-hazardous material as on-site fill material. Preliminary data suggest that the remaining 100 cu yds of overburden soils may be contaminated with chlordane above RBAS levels, but below hazardous waste characteristic levels. If so, it will be disposed off-site as non-hazardous waste at a USEPA-approved facility.

3.4 Investigation-Derived Waste

During several sampling activities, liquid from decontamination procedures was generated. decontamination liquid was placed in four 55-gallon drums and stored in the Co-60 Field at the LEHR Site. Each waste package was incorporated into the LEHR Waste Tracking System as described in SOP 34.5, Waste Tracking System and in the Waste Management Plan.

3.4.1 Characterization

Samples were collected from the four 55-gallon drums of decontamination water and analyzed for the constituents as required by the UC Davis wastewater treatment plant. The analytical results of this sampling effort are summarized in Appendix A.

3.4.2 Storage

The four drums of decontamination water were sealed, assigned waste tracking numbers and transported to Geriatrics Building No. 1 and placed on spill containment pallets. Because the material was generated from an RMMA, it was managed as a potentially mixed waste. The storage area is secured and posted in accordance with the Technical Guidance Document for Waste Management at LEHR (WA, 1999b); the RPP; and LEHR SOPs 34.2, Low-Level Radioactive Waste Storage and 34.4, Clean Waste Handling.

3.4.3 Disposal

Preliminary data indicate that the decontamination water will be classified as a non-hazardous waste. If the decontamination water is designated nonhazardous and it meets all applicable sewer discharge standards, it will be discharged to the sanitary sewer.

4. HEALTH AND SAFETY ACTIVITIES

Health and safety for the activities at the SWT Area were covered by the following documents: the *Project Health and Safety Plan* (PHSP) (WA, 1998c); Health and Safety Procedures (HSPs) (WA, 1998g) and SOPs (WA, 1998g); the *Contingency Plan and General Emergency Response Procedures* (WA, 1998f); the *As-Low-As-Reasonably-Achievable (ALARA) Program* (WA, 1997d), and the RPP (WA, 1998i). The health and safety activities described in this section, coupled with the foregoing listed documents, represent the safety and health program required by 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response and 10 CFR 835, Occupational Radiation Protection, for the work activities at the SWT Area.

During field activities, a photoionization detector (PID), GM probe, and scintillation detector were used to screen for organic vapors and radionuclide activity. Chemical and radiological monitoring is discussed in more detail below.

4.1 Chemical Monitoring

Waste material excavation, stockpiling, sorting, packaging and sampling were identified as activities which may present exposure to chemicals and nuisance dust through contact, ingestion and inhalation. The predominant chemicals identified during waste characterization activities prior to this RA that appeared to be potential occupational concerns were chlordane and SVOCs. No VOCs of occupational concern were previously identified in Site soils.

Contact with chemicals was evaluated and controlled by the proper use of PPE. Real time air monitoring of nuisance respirable dust, nuisance total dust, and VOCs was conducted as is discussed in Section 4.4. Ingestion of chemicals was minimized by use of proper PPE and personal hygiene (e.g. washing of hands and face). Dust suppression using water was an engineering control used to reduce the potential exposure to chemicals.

There are no direct-read instruments to monitor chlordane; however, because an investigation to determine the extent of chlordane in soil was conducted at the SWT Area prior to the RA, data from that investigation were used to identify additional health and safety measures. Chlordane field test kits, which provide real-time same-day data, were used to determine the chlordane concentration in soil. The chlordane concentrations did not require an upgrade to Level C PPE. Nevertheless, personnel wore two outer booties while in the chlordane-impacted area, so that when they left the chlordane-impacted area personnel could take off the outer booties and prevent the spread of chlordane.

SVOCs could not be monitored with direct-read instruments either. However, because SVOCs seemed to be associated with sludge and wood soaked in creosote in previous waste characterization investigations, extreme caution was used during removal of wood or bags of sludge from the excavation to minimize the potential of release and cross contamination.

4.2 Radiological Monitoring

Waste material excavation, stockpiling, sorting, packaging and sampling presented potential exposure to radioactive materials through contact, ingestion and inhalation. The predominant radionuclides used during prior animal research activities were Ra-226 and Sr-90. Based on previous investigations and RAs, the radionuclides of concern from an occupational exposure standpoint during the RA activities appear to be limited to Ra-226, Sr-90, Cs-137, and tritium.

Exposure to radionuclides was evaluated and controlled by the Radiological Control Technicians (RCTs) in accordance with SOPs and HSPs established as part of the RPP. Gross alpha, gross beta, and gross gamma readings were collected by RCTs using field procedures/analyses and utilized as indicators of the presence of radionuclides above background levels that may pose an occupational hazard. Ingestion of radionuclides was minimized by use of proper PPE and personal hygiene (e.g. washing of hands and face). Occupational related monitoring was conducted to determine potential exposure to airborne radioactivity as discussed further in Section 4.4 of this RA Report. The dosage limits for radiation exposure listed in Table 1 of HSP 15.1, External Radiation Exposure Control, were not exceeded at any time during the RA.

Engineering controls were used wherever possible to reduce the potential for internal and external exposure to ALARA levels. Engineering controls were the preferred method to reduce airborne radioactivity exposure and were utilized in lieu of respiratory protection. The main engineering control used was dust suppression by watering/wetting the area of excavation. The applicable ALARA procedures and principles presented in the ALARA Program were followed for conducting this work.

4.3 Physiological Monitoring

Since the RA was conducted between May and October 1998, wearing PPE in this elevated temperature period put workers at a risk of heat stress. All workers had medical clearance prior to working on-site and there was an acclimation period of one to three days for most workers. Daily measurements with a Wet-Bulb-Globe-Temperature instrument were conducted and working conditions were evaluated to minimize heat stress. Based on weather conditions and the PPE used, a work regime was established each day in accordance with the PHSP, Section 5 and HSP 3.1, Working in Hot Environments.

Heat stress prevention included the following mitigation measures: reviewed the signs and symptoms of heat stress in daily tailgate safety meetings, properly resting workers prior to work; scheduled breaks; ensured appropriate water intake; covered work area and/or rest area with portable tarps, and, rotated heavy work tasks. The physiological monitoring included collecting body temperature measurements, heart rate measurements and visual observations of workers as discussed in Section 5 of the PHSP and HSP 3.1. During extremely hot days (temperatures in excess of 100 degrees Fahrenheit) working hours were adjusted to start at 4 A.M. Property lighting was utilized to allow safe work progress during hours without adequate sunlight.

4.4 Air Monitoring

Air monitoring was essential to ensure that all field personnel were adequately protected from airborne contaminants. Air monitoring was conducted in accordance with HSP 6.1, Air Monitoring, HSP 14.1, Airborne Radioactivity Monitoring, and Section 11 of the PHSP and the RPP. All equipment was maintained and calibrated in accordance with the manufacturer recommendations; SOP 25.1, Radiological Surveys and Instrumentation; and HSP 14, Airborne Radioactivity Monitoring.

All personal, integrated air monitoring samples and direct instrumentation readings taken for the purpose of determining appropriate health and safety precautions were collected/taken in the approximate "breathing zone" of site personnel and integrated over an appropriate time interval. As appropriate, selective monitoring of high-risk workers (i.e. those closest to the source of contamination) was also conducted.

During excavation and sampling activities, direct-read instrumentation was used to detect the presence and concentration of hazardous chemicals. The following real-time continuous monitoring was conducted during the waste excavation to assist in identifying hazards: visual inspection, radiological survey instrument readings, PID measurements, and respirable dust monitoring data.

Even though chlordane and SVOCs were the only chemicals identified as potential occupational concerns, air monitoring with a PID for VOCs was conducted during the RA to reduce the likelihood of potential exposure to unanticipated chemicals. If the PID concentrations of airborne dust levels were above the action levels in the PHSP, Section 6, then the PPE would be modified accordingly and additional engineering controls would be implemented when feasible. However during the RA, PID concentrations and airborne dust levels never reached a level where PPE was modified and the only engineering control needed was dust suppression by wetting.

General area radiological air monitoring locations were near/in the work area having the highest potential for generating airborne radioactive contaminants. This monitoring was conducted daily as required by the Radiological Safety Officer (RSO).

General area air samples were compared to airborne radioactive contaminants of the derived air concentrations (DACs) listed in 10 CFR 835, Appendix A. If the general air samples indicated that workers were exposed to airborne radiation contaminants greater than 10% of their respective DAC, then personal air samples (8-hr Time Weighted Average [TWA]) would additionally be used to monitor worker exposure and the RSO would take steps to reduce exposure through engineering controls. General area air samples did not indicate workers were exposed to airborne radioactive contaminants at any time; therefore, personal air sampling for radionuclides was not conducted during the RA.

Real-time continuous dust monitoring was conducted periodically during the RA, along with TWA monitoring, for respirable dust and total dust.

Dust was monitored in the form of nuisance respirable dust and total dust and, if the action levels were exceeded, appropriate measures would be taken. Engineering controls, such as dampening the area with water, were used where practical for maintaining acceptable dust concentration levels. There were no respirable or total dust exceedances and therefore additional measures or PPE were not required.

During the SWT RA, chemical, radiological, and air monitoring was conducted to determine if workers were exposed to any forms of contamination. If action levels were exceeded, PPE would be upgraded and additional engineering controls would be implemented. Based on all the health and safety monitoring conducted during the RA, no action levels were exceeded, no upgrades to PPE were initiated, and no additional engineering controls were implemented other than dust suppression. Therefore, workers were not exposed to any form of contamination. Because workers were not exposed to any contaminants, other on-site personnel, off-site neighbors, and off-site receptors were not exposed to any contaminants during the SWT RA.

5. SAMPLING ACTIVITIES AND ANALYTICAL RESULTS

This section describes sampling activities and presents the analytical results associated with the RA at the SWT Area. Sampling activities commenced on May 18, 1998, and were completed by October 1999. All sampling activities were conducted in accordance with the WP and the Project SOPs. Deviations from or modifications to the WP that resulted from field conditions have been incorporated into the discussion of sampling activities and analytical results.

Several distinct sampling tasks were conducted during the RA. The first set of tasks was designed to provide surface soil characterization information and support the excavation of chlordane-impacted soil excavation activities, including:

- Chlordane Surface Soil Characterization Sampling;
- Chlordane Excavation Screening Sampling; and,
- Chlordane Excavation Confirmation Sampling.

The second set of sampling tasks was designed to support the waste disposal cell excavation activities by guiding the excavation operations and providing confirmation sampling results to support the Phase II data evaluation. These included:

- Chlordane Delineation Sampling within Buried Disposal Cells;
- Disposal Cell Excavation Screening Sampling;
- Disposal Cell Excavation Confirmation Sampling; and,
- Cobble/Gravel Area Characterization Sampling.

The goal of the third set of sampling tasks was to determine whether residual contaminant concentrations in soil are protective of the ground water. These included:

- Nitrate Delineation Sampling; and,
- Designated-Level Sampling.

Finally, a set of sampling tasks addressed waste characterization and designation. These sampling activities are discussed in Section 3.

Each sampling activity and the associated analytical results are described in this section.

5.1 Chlordane Surface Soil Characterization Sampling

Based on previous investigations, chlordane was suspected to be present in the shallow soil in some parts of the SWT Area. Soil sampling was conducted throughout the SWT area to define the vertical and horizontal extent of chlordane in soil. In addition, as requested by the RPMs, the analytical program was expanded to include Ra-226, Cs-137, and Sr-90.

5.1.1 Sampling

Using the grid system described in Section 2, samples were collected at the locations shown in Figure 5-1. As described in the WP, the sampling frequency and depth were based on review of chlordane analytical results from past investigations. The site was divided into two areas. Area 1 was defined as the southwest corner of the SWT Area, where the former chemical dispensing and storage pad had been located and where chlordane had been detected in soil in the past. Samples in Area 1 were initially collected at every grid node from depths of 0.5, 1.5, and 3 ft bgs (Figure 5-1). Area 2 was defined as the area outside of Area 1, where chlordane was not known to have been used. Samples in Area 2 were initially collected on a 30 ft grid at 0.5 and 1.5 ft bgs (Figure 5-1).

A total of 97 soil samples were collected at the SWT Area according to the scope of work defined in the WP and analyzed on-site for chlordane using the field immunoassay-based analytical method (field method). Based on the analytical results of the initial round of sampling, an additional 66 samples were collected at surrounding grid nodes to further delineate the horizontal extent of chlordane in soil.

All samples were collected using a hand auger equipped with a 2-inch barrel. After sampling, each borehole was backfilled with native soil and tamped to form a small mound. The sample locations were marked using flagging or stakes.

At the request of the RPMs, 24 locations across the site were also sampled at 0.5 and 1.5 ft bgs depths for Ra-226, Cs-137, and Sr-90 analysis. These locations coincided with the initial round of chlordane sample locations, at 30 ft grid nodes across the SWT Area (Figure 5-1).

5.1.2 Analytical Results

Soil samples were analyzed for chlordane using USEPA Method 4041, Field Immunoassay. Table 5-1 presents the chlordane surface soil characterization analytical results. The results were compared to immunoassay standards: 160, 800, and 2,400 parts per billion (ppb). The results were therefore reported as either less than 160 ppb, between 160 and 800 ppb, between 800 and 2,400 ppb, or greater than 2,400 ppb. An off-site analytical laboratory was utilized to verify the field analytical results at a rate of approximately 20% of the number of samples collected and analyzed with the field method using USEPA Method 8080. Laboratory verification results are also presented in Table 5-1.

Correlation between field and laboratory methods for chlordane analysis has been performed and is presented in Appendix B of this report.

Field analytical results indicating chlordane concentrations in excess of 800 ppb, either 800 ppb, 2,400 ppb or >2,400 ppb resulted in additional characterization sampling in the lateral or vertical direction depending on the location of detection. Field results less than 800 ppb (either 160-800 or <160 ppb) terminated sampling at that location. In addition, field analytical results greater than 800 ppb resulted in excavation of the surrounding soil, unless the result was considered a "false-positive." A false-positive result was defined as any field analytical result greater than 800 ppb and a laboratory confirmation result less than 800 ppb. For example, sample SSDTF070 had a field analytical result of 800 to 2,400 ppb which turned out to be a false positive result based on a laboratory confirmation result of 496 ppb. In general, the field test kits demonstrated a high (20.70%) rate of false positives and very low (less than two percent) rate of false negatives.

An on-site laboratory was established to analyze soil samples for Ra-226, Cs-137, and Sr-90. Instrumentation included a gamma spectroscopy system equipped with a high purity germanium detector for Ra-226 and Cs-137 and a field beta scintillation detector for Sr-90. Table 5-2 presents the surface soil characterization analytical results for Ra-226, Cs-137, and Sr-90. The Ra-226 and Sr-90 results of the field analyses were compared with the Screening Criteria (SC) of 0.75 picoCuries per gram (pCi/g) and 10 pCi/g, respectively. Although Cs-137 was not a driver COC, its analytical results were also compared to the background soil level established for the SWT Area (0.01 pCi/g). Cs-137 was detected above background; however, the levels were consistent with values observed in surface soil near the site and associated with nuclear fallout as discussed in the *Off-Site Cesium-137 Investigation Report* (WA, 1999a). As shown in Table 5-2, Ra-226 and Sr-90 did not exceed their respective SC.

5.2 Chlordane Excavation Screening Sampling

Surface soil containing greater than 800 ppb chlordane was excavated and removed. Excavation boundaries were set at half the distance between "contaminated" and the adjacent "clean" location. Following the first round of excavation activities, screening samples were collected from the sidewalls and the bottom of the excavations. These samples were used to guide excavation activities to remove the chlordane-contaminated soil.

5.2.1 Sampling

Excavation screening samples were collected at six to eight inches below the floor and into the sidewalls of each excavation. A total of 47 samples were collected using a hand auger. Figure 5-2 shows the location of chlordane excavation screening samples. Screening samples were collected at the grid nodes along the floor of the excavation and at 10 ft intervals along the sidewalls of the excavation.

5.2.2 Analytical Results

A total of 47 chlordane excavation screening samples were collected and analyzed for chlordane by USEPA Method 4041, using the field analytical test kits. Chlordane excavation screening analytical results are presented in Table 5-3. Field analyses greater than 800 ppb indicated that chlordane may be present in excess of the SC. In the three smaller 10 ft by 10 ft excavations, only two sidewall samples exceeded the 800 ppb SC, at 800 to 2,400 ppb. Given the relative frequency of high false-positive readings associated with the field test kits, these sample results did not warrant additional excavation. Confirmation sampling was used to verify this assumption.

In the large excavation located in the southwest corner of the SWT Area, several samples along grid lines W10 and W8 had contained greater than 800 ppb chlordane. During excavation screening sampling at these locations, waste-like material was observed 12 inches below the excavation floor. This indicated that the top of a waste disposal cell had been uncovered and that chlordane could have infiltrated the waste matrix. At that point, no additional soil excavation was warranted until further delineation of the waste disposal cell could be performed.

5.3 Chlordane Excavation Confirmation Sampling

Once excavation screening samples indicated that the chlordane SC had been reached, excavation confirmation sampling was conducted. The objective of this sampling was to ensure attainment of the chlordane cleanup goal using a statistically-based sampling design. The statistical approach used to determine the required number of confirmation samples and the grid size was developed in accordance with *Statistical Methods for Evaluating the Attainment of Cleanup Standards, Volume 3: Reference Based Standards for Soils and Solid Media* (USEPA, 1994). Attachment I, Appendix A of the WP presented the calculations and statistical formula used to determine the required number of confirmation samples.

5.3.1 Sampling

Samples were collected from the sidewalls and floor of the excavation as determined by the random start and grid size evaluation. Figure 5-3 presents the chlordane excavation confirmation sampling locations. Sample depths ranged from 0.5–4.0 ft bgs. A total of 17 confirmation samples and two duplicate samples were collected by hand auger from the chlordane excavations. A grid size of 14 ft was calculated using the USEPA recommended statistical methods and was used for sample location determination.

5.3.2 Analytical Results

Chlordane excavation confirmation sampling results are presented in Table 5-4. Samples were analyzed for pesticides/PCBs using USEPA Method 8080. As shown in Table 5-4, only eight pesticide analytes were detected in one or more samples. Specifically, 4,4'-DDE, 4,4'-DDT, alpha chlordane, endrin, gamma-BHC, gamma chlordane, heptachlor, and heptachlor epoxide were detected. Only gamma chlordane along with heptachlor and heptachlor epoxide were detected at levels above the reporting limit. None of the detected values exceeded the lowest chlordane RBAS value of 780 µg/kg.

5.4 Chlordane Delineation Sampling within Buried Disposal Cells

During chlordane excavation screening sampling, two waste disposal cells were discovered within the large chlordane excavation (located in the southwest corner, see Figure 5-3). Since the contents of the waste disposal cells were considered to be low-level radioactive waste, and given that chlordane had been detected in the overlying soil, the potential for mixed-waste existed. Therefore, to better define the physical extent of these waste disposal cells and determine the chlordane concentration within the waste matrix, a direct-push drilling system was mobilized to the site and borings were advanced on 5-ft grid centers.

5.4.1 Sampling

A total of 51 soil borings were advanced to varying depths within the large chlordane excavation. Clear Butyrate liners were used during drilling operations to identify the material and note the lithology with minimal handling of the core.

As shown in Figure 5-4, several samples were collected from borings that penetrated the waste disposal cells. Samples of the waste matrix were collected at approximately 3-ft vertical intervals until the native soil was encountered.

In addition to soil borings within the chlordane excavation, the direct-push drill rig was used to complete the trench grid pattern south of the chlordane excavation. Twelve borings were drilled in this area to a depth of six ft bgs, and no waste was identified.

5.4.2 Analytical Results

Samples collected from the waste matrix where sent to an off-site laboratory for chlordane analysis using USEPA Method 8080. Table 5-5 presents the results of the in-situ chlordane delineation sampling. A total of 25 soil samples (23 primary samples and two duplicate samples) were analyzed for chlordane. As shown in Figure 5-4, the maximum chlordane concentrations were found in the top or middle samples where gravel and other permeable unconsolidated material were present. Sampling results were later used in conjunction with waste excavation and segregation activities to minimize the volume of potential mixed waste.

5.5 Disposal Cell Excavation Screening Sampling

Waste removal activities were described in Section 2. Following waste removal, soil samples were collected from the excavations and analyzed to help guide removal activities and determine whether the SC for driver COCs were attained. Specifically, samples were collected from the sidewalls and bottoms of the excavations and analyzed for the six driver COCs Ra-226, Sr-90, chlordane, mercury, hexavalent chromium, and nitrate. These "screening samples" were analyzed for driver COCs using either field or laboratory analytical methods.

The screening analytical results were compared to the SC defined in the RA WP. The SC used during the RA were:

- chlordane = 800 µg/kg;
- mercury = 0.63 milligram per kilogram (mg/kg);
- hexavalent chromium = 3.8 mg/kg;
- nitrate = 36 mg/kg;
- Ra-226 = 0.75 pCi/g; and,
- Sr-90 = 10 pCi/g.

As discussed in Section 2, Northern, Western, and Southern excavation areas were defined at the completion of the RA. Figure 2-3 shows the locations of these excavation areas. The following section presents the analytical results of waste excavation screening samples for each excavation area.

5.5.1 Northern Excavation Area

In the Northern Excavation Area, 25 soil samples were analyzed for chlordane, hexavalent chromium, mercury, and nitrate, and 35 soil samples (including the 25 soil samples mentioned above) were analyzed for Ra-226 and Sr-90. The screening samples were collected at approximate 20 ft intervals along the length of the trench from the sidewalls and bottom of the excavation. Figure 5-5 presents the screening sample locations. Sidewall samples were sometimes collected at two depths, as determined based on the trench depth. Those samples were usually collected at the top and bottom of the disposal cell, and penetrated the sidewall by approximately six inches. The samples from the bottom of the excavation were collected approximately six to 12 inches below the excavation.

Screening analytical results for the Northern Excavation Area are shown in Table 5-6. None of the 25 samples analyzed for chlordane contained greater than the 800 µg/kg SC. Similarly, none of the samples exceeded the 3.8 mg/kg SC for hexavalent chromium. Eleven of the 25 samples exceeded the 0.63 mg/kg mercury background concentration. The maximum mercury concentration detected in this area was 2.01 mg/kg.

None of the 25 samples analyzed for nitrate exceeded the 36 mg/kg SC. All 35 sample results were below the SC for Ra-226. All 35 analytic results were below the 0.75 pCi/g for Ra-226. All 35 analytic results were below the 10 pCi/g SC for Sr-90.

5.5.2 Western Excavation Area

Screening soil samples were collected in the western excavation based on visual observations of waste items removed, at no less than 20 ft intervals along the sidewall and floor of the excavation. Since the waste material in these trenches appeared more heterogeneous, samples were collected at a higher frequency than in the northern excavations. Figure 5-5 presents the locations of screening samples within the Western Excavation Area.

Screening analytical results for the Western Excavation Area are shown in Table 5-6. In the Western Excavation Area, 63 soil samples and seven field duplicates were analyzed for chlordane; 59 soil samples and seven field duplicates were analyzed for hexavalent chromium, mercury, and nitrate; and 62 soil samples and seven field duplicates were analyzed for Ra-226 and Sr-90. Three of the 63 soil samples, SSDTF294, SSDTF403 and SSDTF425, contained greater than 800 µg/kg chlordane. The area around sample SSDTF294 was excavated and subsequent samples (SSDTF558-561) contained less than the 800 µg/kg chlordane SC. Sample SSDTF403 was sent to a laboratory for confirmation analysis and was determined to contain chlordane below the 800 µg/kg SC (670 µg/kg). Sample SSDTF425 was a duplicate of sample SSDTF424 which contained 879 µg/kg chlordane. None of the samples exceeded the SC for hexavalent chromium or Ra-226. Only one sample (SSDTF420) exceeded the Sr-90 SC at an activity of 25.6 pCi/g. The area around this sample was subsequently excavated and re-sampled. Subsequent analysis (SSDTF440-442) found Sr-90 below the 10 pCi/g SC.

Sixteen of the 59 samples exceeded the 0.63 mg/kg mercury background concentration.

Thirty-one soil samples contained nitrate in concentrations greater than the 36 mg/kg background and SC value. Nitrate concentrations exceeding the SC ranged from 49.4 mg/kg to 1,070 mg/kg. Review of the nitrate data indicates that concentrations increase with depth from five ft to 12 ft bgs, and the highest nitrate concentrations (i.e. sample SSDTF494 at 1,070 mg/kg) were detected at the trench floor.

To further delineate the vertical extent of nitrate within Trench W8, several additional samples were collected beneath the trench floor and analyzed for nitrate. Samples SSDTF575 through SSDTF591 were collected at depths ranging from 12 to 19 ft bgs (7 ft below trench floor). Nitrate concentrations generally decreased from 12 to 19 ft. For example, sample SSDTF581, collected at 12 ft bgs, contained 931 mg/kg nitrate. At location SSDTF587, a sample collected 19 ft bgs had a nitrate concentration of 108 mg/kg.

5.5.3 Southern Excavation Area

In the Southern Excavation Area, screening samples were collected at least every 10 ft along the sidewalls and floor of the excavation based on information gathered during exploratory trenching. Specifically, a large cache of laboratory vials and glassware was discovered during grid trenching in this area. In addition, tritium was detected in one of the bottles recovered from the trench, which raised concern about potential spread of contamination due to tritium's high mobility in the environment. Figure 5-5 presents the location of screening samples in the Southern Excavation Area.

Screening analytical results for the Southern Excavation Area are shown in Table 5-7. In this area, 33 soil samples and five field duplicates were analyzed for chlordane, hexavalent chromium, mercury, nitrate, Ra-226 and Sr-90. None of the 33 soil samples analyzed for chlordane, hexavalent chromium, Ra-226 and Sr-90 contained concentrations of these compounds greater than the SCs. Nitrate was detected at 38.8 mg/kg in one of the 33 soil samples, slightly above its 36 mg/kg background and SC value. Mercury was detected in six samples above the 0.63 mg/kg value.

In the Southern Excavation Area, tritium was detected in a smear taken from one of the laboratory bottles during the waste removal activities. Tritium was therefore analyzed in 26 samples (and three field duplicates), and the highest reported activity was 0.082 pCi/g. However, all tritium results were below the laboratory's minimum detectable activities (MDA).

5.6 Disposal Cell Excavation Confirmation Sampling

Once disposal cell excavation screening samples indicated that the SC had been met, excavation confirmation sampling was conducted. The objective of this sampling was to ensure the attainment of cleanup goals using a statistically-based sampling design. The statistical approach used to determine the required number of confirmation samples and the grid size was in accordance with USEPA guidance (USEPA, 1994). Appendix A of the WP Attachment I included the calculations and statistical formulas used to determine the required number of confirmation samples.

5.6.1 Sampling

Waste excavation confirmation sampling was conducted in the disposal cells from the Northern, Western and Southern excavations (Figure 5-6). The confirmation samples were collected from the excavation sidewalls and floor to verify that the cleanup criteria for all COCs were met. Disposal cell excavation confirmation sampling was conducted between September 23 and October 1, 1998. A total of 63 samples and seven duplicate samples were collected between two and 13 ft bgs using a hand auger advanced from an extendable boom and put into pre-sterilized glass jars. The disposal cell excavation confirmation samples were packaged and shipped to an off-site laboratory analysis of the full set of COCs, consisting of radionuclides, pesticides/PCBs, metals, VOCs, SVOCs and nitrate. An equipment rinsate blank was also collected and analyzed for the full set of COCs. All samples were cleared for release by an RCT prior to shipment off-site.

Twenty-three excavation confirmation samples (SSDTC032-034, 037, 039, 055 through 059, 062 through 073 and 090) were collected from the Northern excavation. Two of the samples were field duplicate samples, SSDTC056 and SSDTC069.

Thirty-one excavation confirmation samples (SSDTC031, 043 through 054, 060, 061, 074 through 089) were collected from the Western excavation. Three of the samples were field duplicate samples, SSDTC061, 075, and 089.

Seventeen excavation confirmation samples (SSDTC020 through 030, 035, 036, 038, 040 through 042) were collected from the Southern excavation. Two of the samples were field duplicate samples, SSDTC036 and 042.

5.6.2 Analytical Results

Results of the disposal cell excavation confirmation sampling are summarized in Table 5-8. Appendix C lists all analytic results for the full set of COCs. The discussion below focuses on the 75 risk-related COCs discussed in Section 6.

5.6.2.1 Radionuclides

Fifteen radionuclides were detected above detection limits, and 14 of the 15 radionuclides were detected above background. Three of the fourteen radionuclides detected above background were daughter products (DPs) with short half-lives (Bi-212, Bi-214 and Pb-212 with half-lives less than one hour), therefore they are not discussed below. The following radionuclides were detected above background:

- Americium-241 (Am-241) was detected in three samples ranging from 0.029 to 1.61 pCi/g;
- C-14 was detected in 24 samples ranging from 0.137 to 5.84 pCi/g;
- Cs-137 was detected in eight samples ranging from 0.0219 to 1.18 pCi/g;
- Pb-210 was detected in two samples at 1.61 pCi/g to 4.43 pCi/g;
- Plutonium-241 (Pu-241) was detected in one sample at 0.52 pCi/g;
- Ra-226 was detected in one sample at 0.76 pCi/g;
- Sr-90 was detected in 21 samples ranging from 0.0798 to 7.91 pCi/g;
- Th-228 was detected in five samples ranging from 0.762 to 0.894 pCi/g;
- Th-234 was detected in 19 samples ranging from 0.808 to 3.74 pCi/g;
- Tritium was detected in 11 samples ranging from 1.21 to 5.20 pCi/g; and,
- U-235 was detected in three samples ranging from 0.0418 to 0.06 pCi/g.

Presented below is a summary of the excavation areas where the samples with maximum activity were located.

Northern Excavation

In the Northern Excavation Area, 23 samples were collected and only one sample, SSDTC090, collected from 11 ft bgs contained the maximum activity of Am-241 at 1.61 pCi/g.

Western Excavation

Six of the 31 samples collected from the Western Excavation contained the maximum activity of six radionuclides. The results are summarized below:

- Sample SSDTC086 collected from a depth of four ft bgs contained the maximum activity of tritium at 5.20 pCi/g;
- Sample SSDTC076 collected from a depth of five ft bgs contained the maximum activity of Th-228 at 0.89 pCi/g;
- Sample SSDTC079 collected from a depth of eight ft bgs contained the maximum activity of U-235 at 0.06 pCi/g;
- Samples SSDTC046 and SSDTC078 collected from a depth of 12 ft bgs contained the maximum activity of Ra-226 at 0.76 pCi/g and Pb-210 at 4.43 pCi/g, respectively; and,
- Sample SSDTC043 collected from a depth of 13 ft bgs contained the maximum activity of Th-234 at 3.74 pCi/g.

Southern Excavation

Three of 17 samples collected from the Southern Excavation contained the maximum activity of four radionuclides. Presented below are the results:

- Sample SSDTC020 collected from a depth of three ft bgs contained the maximum activity of Pu-241 at 0.52 pCi/g and Sr-90 at 7.91 pCi/g;
- Sample SSDTC024 collected from a depth of three ft bgs contained the maximum activity of C-14 at 5.84 pCi/g; and,
- Sample SSDTC036 collected from a depth of six ft bgs contained the maximum activity of Cs-137 1.18 pCi/g;

5.6.2.2 Pesticides

Ten pesticides were detected in the disposal cell confirmation sampling. The results are summarized as follows:

- 4,4'-DDD was detected in six samples ranging from 2.6 to 11.5 micrograms/kilogram (µg/kg);

- 4,4'-DDE was detected in 28 samples ranging from 0.065 to 26.80 µg/kg;
- 4,4'-DDT was detected in six samples ranging from 35.9 to 276 µg/kg;
- Alpha-chlordane was detected in 44 samples ranging from 0.17 to 110 µg/kg;
- Delta-BHC was detected in one sample at 0.12 µg/kg;
- Dieldren was detected in one sample at 0.63 µg/kg;
- Endosulfan Sulfate was detected in one sample at 0.09 µg/kg;
- Gamma-chlordane was detected in 44 samples ranging from 0.12 to 94.80 µg/kg;
- Heptachlor was detected in 12 samples ranging from 0.2 to 16.70 µg/kg; and,
- PCB-1260 Arochlor was detected in one sample at 9.7 µg/kg.

Presented below is a summary of the excavation areas from where the samples with maximum concentrations were located.

Northern Excavation

Three of the 23 samples collected from the Northern Excavation contained the maximum concentration of six pesticides.

- Sample SSDTC058 collected from a depth of four ft bgs contained the maximum concentration of alpha-chlordane and gamma-chlordane at 110 and 94.8 µg/kg, respectively;
- Sample SSDTC062 collected from a depth of four ft bgs contained the maximum concentration of 4,4'-DDE at 26.8 µg/kg; and,
- Sample SSDTC072 collected from a depth of five ft bgs contained the maximum concentrations of delta-BHC, dieldrin, and endosulfan sulfate at 0.12, 0.63 and 0.09 µg/kg, respectively.

Western Excavation

Three of the 31 samples collected from the Western Excavation contained the maximum concentration of three pesticides.

- Sample SSDTC044 collected from a depth of 12 ft bgs contained the maximum concentration of 4,4'-DDD at 11.5 µg/kg;
- Sample SSDTC045 collected from a depth of 12 ft bgs contained the maximum concentration of Heptachlor at 16.76 µg/kg; and,
- Sample SSDTC046 collected from a depth of 12 ft bgs contained the maximum concentration of PCB-1260 (Arochlor) at 9.7 µg/kg.

Southern Excavation

In the Southern Excavation, 17 samples were collected and only sample SSDTC041 contained pesticides. Sample SSDTC041 collected from a depth of six ft bgs contained the maximum concentration of 4,4'-DDT at 276 µg/kg.

5.6.2.3 Volatile Organic Compounds

Five VOCs were detected above detection limits:

- Acetone was detected in one sample at 14.9 µg/kg;
- 2-Butanone was detected in nine samples ranging from 3.92 to 548 µg/kg;
- Ethylbenzyne was detected in 13 samples ranging from 0.577 to 2.87 µg/kg;
- Styrene was detected in one sample at 1.03 µg/kg;
- Toluene was detected in 40 samples ranging from 0.723 to 438 µg/kg; and,
- Total xylenes were detected in 23 samples ranging from 0.534 to 16.40 µg/kg.

Presented below is a summary of the excavation areas from where the samples with maximum were located.

Northern Excavation

Two of the 23 samples collected from the Northern Excavation contained the maximum concentration of two VOCs.

- Sample SSDTC056 collected from a depth of five ft bgs contained the maximum concentration of toluene at 438 µg/kg; and,
- Sample SSDTC090 at a depth of 11 ft bgs contained the maximum concentration of styrene at 1.03 µg/kg.

Western Excavation

Three of the 31 samples collected from the Western Excavation contained the maximum concentration of three VOCs.

- Sample SSDTC049 collected from a depth of four ft bgs contained the maximum concentration of 2-Butanone at 548 µg/kg;
- Sample SSDTC075 collected from a depth of three ft bgs contained the maximum concentration of xylenes at 16.4 µg/kg; and,
- sample SSDTC081 collected from a depth of 12 ft bgs contained the maximum concentration of acetone at 14.9 µg/kg.

5.6.2.4 Metals

Eleven metals were detected above detection limits; ten of the 11 metals were detected above background. The metals above background were:

- Antimony was detected in one sample at 1.5 mg/kg;
- Barium was detected in one sample at 286 mg/kg;
- Chromium detected in seven samples ranging from 186 to 314 mg/kg;
- Hexavalent chromium was detected in 42 samples ranging from 0.0798 to 1.06 mg/kg but all concentrations are below the cleanup level of 3.6 mg/kg;
- Lead was detected in one sample at 10.3 mg/kg;
- Manganese was detected in six samples ranging from 755 to 968 mg/kg;
- Mercury was detected in 23 samples ranging from 0.66 to 6.1 mg/kg;
- Selenium was detected in three samples ranging from 1.4 to 1.6 mg/kg;
- Silver was detected in two samples at 0.75 mg/kg; and,
- Zinc was detected in one sample at 150 mg/kg.

Presented below is a summary of the excavation areas where the samples with maximum concentrations were located.

Northern Excavation

One of the 23 samples collected from the Northern Excavation contained the maximum concentration of two metals. Sample SSDTC069 collected from a depth of four ft bgs contained the maximum concentration of antimony and mercury at 1.5 and 6.10 mg/kg.

Western Excavation

Four of the 31 samples collected from the Western Excavation contained the maximum concentration of four metals.

- Sample SSDTC052 collected from a depth of four ft bgs contained the maximum concentration of silver at 0.75 mg/kg;
- Samples SSDTC080 and SSDTC089 collected from a depth of 12 ft bgs contained the maximum concentrations of manganese and selenium at 968 and 1.6 mg/kg, respectively; and,
- Sample SSDTC087 collected from a depth of 10 ft bgs contained the maximum concentration of barium at 286 mg/kg.

Southern Excavation

Three of the 17 samples collected from the Southern Excavation contained the maximum concentration of three metals. All three of these samples were collected from a depth of three ft bgs.

- Samples SSDTC020 contained the maximum concentration of zinc at 150 mg/kg;
- Sample SSDTC025 contained the maximum concentration of chromium at 314 mg/kg; and,
- Sample SSDTC029 contained the maximum concentration of lead at 10.3 mg/kg.

5.6.2.5 Nitrate

Nitrate was detected above detection limits in 40 samples and 19 of the 40 samples were above background. The maximum concentration of nitrate was at 909 mg/kg in sample SSDTC082 collected from a depth of 12 ft bgs in the Western Excavation Area. Additional nitrate delineation samples have been collected and analyzed. The results are presented in Section 5.8.

5.6.2.6 Summary

Below is a brief summary of the disposal cell confirmation sampling for each excavation area. Section 6 discusses the human health risk associated with these results.

Northern Excavation

The only metals detected above background in the Northern Excavation Area were antimony and mercury at a depth of four ft bgs. The only pesticides found in the Northern Excavation Area were 4,4'-DDE, alpha-chlordane and gamma-chlordane at four ft bgs and delta-BHC, dieldrin and endosulfan sulfate at five ft bgs. The only radionuclide detected above background in the Northern Excavation Area was Am-241 at 11 ft bgs. The only VOCs detected in the Northern Excavation Area were toluene at five ft bgs and styrene at 11 ft bgs.

Western Excavation

The only metals detected above background in the Western Excavation Area were silver and hexavalent chromium at four ft bgs, barium at 10 ft bgs and manganese and selenium at 12 ft bgs. The pesticides detected in the Western Excavation Area were 4,4'-DDD, heptachlor and PCB-1260 (Arochlor) at 12 ft bgs. The radionuclides detected above background in the Western Excavation Area were tritium at four ft bgs, Th-228 at five ft bgs, U-235 at eight ft bgs, Pb-210, and Ra-226 at 12 ft bgs and Th-234 at 13 ft bgs. The VOCs detected in the Western Excavation Area were xylenes at three ft bgs, 2-butanone at four ft bgs and acetone at 12 ft bgs.

Southern Excavation

The only metals detected above background in the Southern Excavation Area were chromium, lead, and zinc at three ft bgs. The only pesticide was 4,4'-DDT at six ft bgs. The only radionuclides detected above background in the Southern Excavation Area were C-14, Pu-241 and Sr-90 at three ft bgs and Cs-137 at six ft bgs.

5.7 Cobble/Gravel Area Characterization Sampling

As discussed in Section 2, surface gravel and subsurface cobble trenches were discovered during exploratory grid trenching. Since no waste items had been noted in this area and the field instrumentation did not indicate the presence of contaminants, these features were not removed. Rather, a sampling plan was prepared to characterize the cobble features and the soil beneath the area.

5.7.1 Sampling

In the Cobble/Gravel Area, 18 samples were collected from the soil beneath the cobbles and gravel (Figure 5-7). In addition, 10 cobble samples and one field duplicate were also collected. Samples were collected with a scoop, assisted by a backhoe that removed the cobbles and gravel. Soil samples were collected six inches into the native soil at depths ranging from 2.0 ft bgs to 4.5 ft bgs. Cobbles were selected either randomly or based on visual observations and sent to the laboratory for preparation that included shaving and grinding the surface of the cobble and analyzing this ground material.

5.7.2 Analytical Results

All soil samples were analyzed for the full set of COCs. Table 5-8 presents the soil analytical results for the driver COCs. The 18 soil samples were also analyzed on-site for Ra-226 and Sr-90. Table 5-9 presents the results of on-site Ra-226 and Sr-90 analysis. None of the 18 soil samples analyzed for nitrate, hexavalent chromium, Ra-226, Sr-90 and chlordane contained concentrations greater than the SCs. Mercury was detected above the 0.63 mg/kg SC in 11 soil samples, with a maximum concentration of 3.23 mg/kg.

Cobble samples were analyzed at an off-site laboratory for driver COCs, gross alpha/beta and gamma spectrometry using standard USEPA methods. Table 5-9 presents the cobble sampling analytical results for the driver COCs. None of the 11 cobble samples analyzed for nitrate, hexavalent chromium, Ra-226 and Sr-90 contained concentrations greater than the SCs. Mercury was detected above the 0.63 mg/kg SC in three samples. Chlordane was detected above the 800 µg/kg SC in one duplicate sample at a concentration of 3,590 µg/kg.

5.8 Nitrate Delineation Sampling

Excavation screening sampling results indicated that nitrate was present in approximately 40% of samples. In the Western Excavation Area, nitrate was detected above the 36 mg/kg background concentration at depths raging from five to 19 ft bgs. A sampling plan was subsequently prepared to delineate the lateral and vertical extent of nitrate at the SWT Area.

5.8.1 Sampling

Using a direct-push drilling system, soil samples were collected around the Western Excavation Area and analyzed for nitrate. Boring locations (Figure 5-8) were concentrated in the vicinity of Trenches W-8 and W-10. Forty borings were drilled on a 10-ft grid pattern to a depth of 30 ft bgs. Samples were collected at 3-ft intervals, starting at 12 ft bgs in locations over excavated waste cells, and at three ft bgs in locations outside previously excavated areas. A total of 371 samples collected for nitrate: 337 primary samples and 34 were field duplicates. Once each boring was completed and samples collected, it was grouted to one ft below grade, topped with soil and marked with a flag.

5.8.2 Analytical Results

Results of the nitrate analyses are presented in Table 5-11. The results indicate that nitrate was detected in several locations and depths above SC levels. The northern end of Trenches W-8 and W-10 contained the highest and deepest concentrations of nitrate above SC. Figure 5-9 presents concentration nitrate contours at a depth of 12-15 ft bgs. Nitrate concentrations above background reached 30 ft bgs. The horizontal extent of nitrate appeared to be confined within the area of investigation. Figure 5-10 shows the vertical distribution of nitrate along cross-section A-A'. The highest nitrate concentrations were found immediately beneath the trench bottom to a depth of 15 to 18 ft bgs.

5.9 Designated Level Analysis Phase B – Data Gaps Investigations

5.9.1 Sampling

As described in *Designated Level Sampling and Analysis Plan for the Southwest Trenches Area* (WA, 1999c), six soil borings were drilled and sampled in the SWT Area on October 26 through 28, 1999 to provide additional information on the vertical distribution of Cs-137, C-14, and tritium in soil. The two locations with the highest and second highest activities for each of these three constituents (as indicated by the confirmation sample analytical data) were selected as boring locations (Figure 5-11). Samples were collected every five ft, starting at ten ft bgs. The deepest samples collected in the tritium and Cs-137 boreholes were at 30 ft bgs, and the deepest samples collected in the C-14 boreholes were at 45 ft bgs. The samples were analyzed for the COC associated with each sampling location.

5.9.2 Analytical Results

The analytical results for these samples are presented in Table 5-12. As shown, tritium results were below the LEHR background level of 1.2 pCi/g in all samples from both borings, with no obvious activity trend with depth. C-14 activities in boring DL-3 are above the LEHR background level of 0.13 pCi/g at all depths, with a generally decreasing activity trend with depth. In boring DL-4, the sample from 10 ft bgs had a C-14 activity of 0.352 pCi/g. All deeper samples had lower C-14 activities that showed no trend with depth and were near or below the background activity. All Cs-137 activities at all depths in both DL borings were below the 0.012 pCi/g background level.

These analytical results were used to set the COC impact depth intervals for the refined DL modeling described in Section 6.4. A typical soil profile for the SWT Area, based on lithologies encountered in these six new borings as well as the RA trenches is presented in Table 5-13. This soil profile was also used in the refined DL modeling described in Section 6.4.

5.10 Air Sampling

Air samples were collected during the RA from four stations placed around the perimeter of the site and one distant station serving as the background station. These ambient air stations were strategically placed to monitor every area of the Site. The location of the air stations are listed below:

- Air monitoring location (AML)-2 is located at the upper northeast corner of the Toxic Pollutant Health Research Laboratory;
- AML-3 is positioned near the UCD Landfill No. 3, which is ½-mile west of the LEHR site;
- AML-5 is situated near the Western Dog Pens directly on the southern boundary of the site;
- AML-6, the current background station, is located at the Long Term Research on Agricultural System, which is approximately nine miles northwest from the LEHR site; and,
- AML-7, a mobile monitoring station was stationed at the Southwest Trenches.

Figure 5-12 illustrates the locations of the air monitoring stations at LEHR.

5.10.1 Air Sampling Schedule

Air samples from LEHR were all analyzed by either California State-certified or CLP laboratories. Air monitoring at the site was implemented to determine potential releases of radionuclides, VOCs, SVOCs, and metals into ambient air, which might be associated with the RA. The collection of air samples was based on an established schedule that corresponded with the 1998 RA. Gross alpha and beta air samples were collected continuously on a biweekly basis with one composite (gamma) analysis during the RA. Monthly samples of tritium, radon, metals, VOCs, and SVOCs were collected and sent for analyses.

5.10.2 Statistical Tests (Wilcoxon Rank Sum and Sign Tests)

The air data were not normally distributed; therefore, nonparametric techniques such as the Wilcoxon Rank Sum (WRS) and Sign Tests were utilized to perform the statistical analyses. The WRS Test was used to determine if the data was similar to background levels and therefore did not have a negative impact on ambient air quality. The Sign Test was used to compare the median analytical data to one of the following regulatory risk guidelines depending on which value was available for each COC:

- USEPA Region 9 Preliminary Remedial Goal (PRG) ambient air values (if available)—health-based concentrations that correspond to either a one-in-one million (1×10^{-6}) cancer risk or a chronic health quotient of one, or whichever is lower if the COC is a classified both as a carcinogen and non-carcinogen;
- Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELS)—maximum air concentrations allowed to exposed workers based on a time-weighted averaged for an eight-hour workshift; and,
- DOE Derived Concentration Guide (DCG) for ambient air radionuclides—The DCG values represent the concentrations of radionuclides in air that an individual could continuously inhale and be immersed in at average annual rates without receiving an effective dose equivalent to or greater than 100 millirem per year (PNNL, 1996).

5.10.3 Analytical Results

The analytical results for the air monitoring samples collected during the RA are presented in Table 5-14.

- Overall, the effect of chlordane contaminated surface soil re-suspending to ambient air was minimal at LEHR during the 1998 RA;
- Air concentrations for the majority of the VOCs were below their detection limits; and,

- Air concentrations for the majority of metals/inorganics were below the PRG ambient air values or their specific background concentrations except chromium VI and magnesium.

The following COCs exceeded their respective PRG values.

Category	Contaminant of Concern	Average Concentration [$\mu g/m^3$]	Maximum Concentration [$\mu g/m^3$]	PRG Values [$\mu g/m^3$]
Metal	Chromium VI	3.5E-03	7.8E-03	2.3E-05
Metal	Magnesium	0.23	0.93	0.34
Pesticide	Chlordane	1.7E-02	2.6E-02	1.9E-02
VOC	1,4-Dioxane	18	51	6.1E-02
VOC	Benzene	2.8	18	0.23
VOC	Chlorobenzene	12	33	21
VOC	Chloromethane	1.6	3.2	1.1

All detected COCs were below the OSHA PEL; the detected radionuclides were either below their specific background values or below the DCG during the RA.

The two detected samples of chlordane were detected at AML-7, which was in the RA area and attributed to the excavation activities at the Southwest Trenches. Although exposed surfaces were constantly wetted down with water, it is possible a small amount of chlordane-contaminated soil dust can arise from several disturbances such as mechanical soil loading and off loading to the storage pile and strong wind currents. Likely, the detected samples were attributed to the strong wind currents to the north, which were common during the summer months as well as loading of contaminated soils onto and from a storage pile at the Western Dog Pens. The detected chlordane concentrations were below the OSHA PEL of 0.5 mg/m^3.

1,4-dioxane was detected in 19 samples with every monitoring station showing concentrations higher than the PRG ambient air limit of 0.61 $\mu g/m^3$ but below the OSHA PEL requirement of 360 mg/m^3. In the past air monitoring activity at LEHR, 1,4-dioxane was not detected. All 19 samples were detected during the summer of 1998. Field activity from the summer of 1998 did not cause or agitate the release of 1,4-dioxane since it only involved the removal of contaminated wastes that did not contain this compound. Contamination within the laboratory procedures is unlikely since laboratory blanks showed no detection for 1,4-dioxane. The source is unknown, but the impact of 1,4-dioxane emission at LEHR ambient air was minimal since all concentrations were below the OSHA carcinogenic dose limit.

Chromium VI is considered a high-risk metal when exposed at elevated concentrations. Chromium VI concentrations were higher than the PRG ambient air limit. During the soil investigation, chromium VI concentrations were found higher than the soil PRG limit. Since most of the surfaces at LEHR are unpaved, emissions from chromium VI contaminated soils re-suspending to ambient air are possible especially with the strong wind influences at LEHR. The maximum chromium VI concentration detected at LEHR was below the OSHA PEL of 0.1 mg/m^3.

During the RA, detected air concentrations that were above the PRG ambient air values did not pose any significant health threat to the site workers or the public; COCs above the PRG ambient air values were all below the OSHA PELs. In addition, radiological concerns from the emissions of radionuclides at LEHR were unlikely during the RA. All detected radionuclides were either below their specific background values or below the DCG.

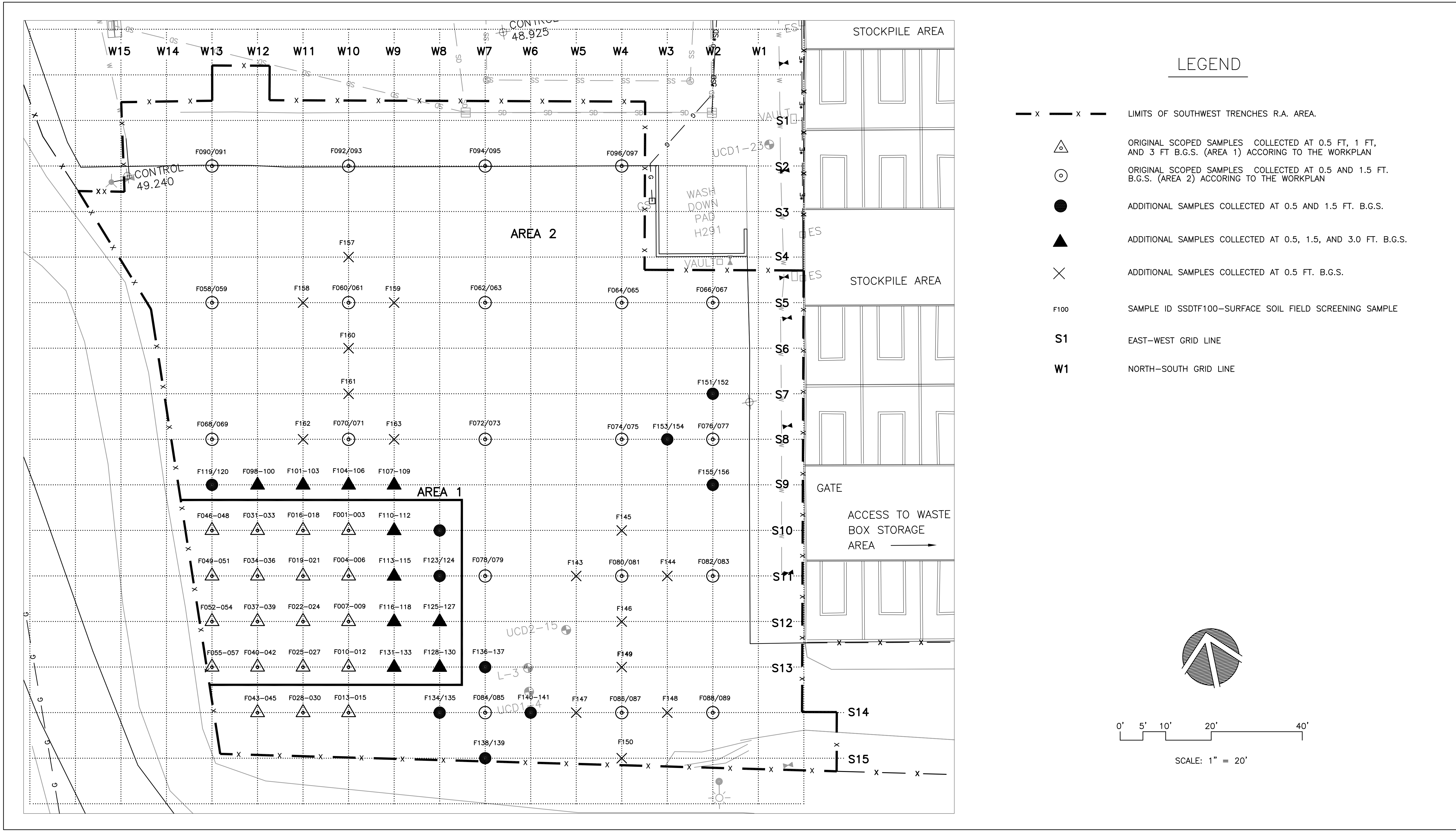
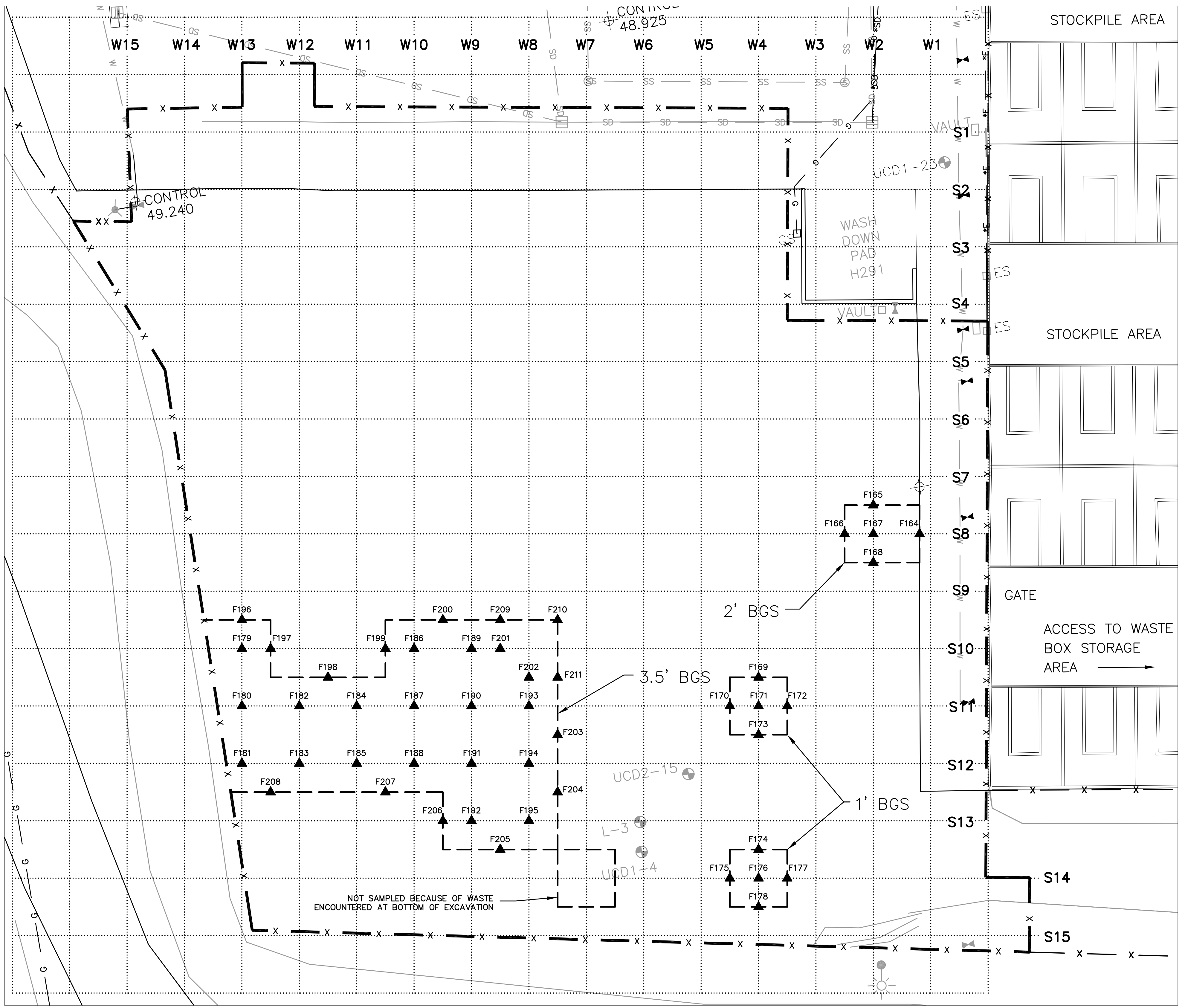


FIGURE 5-1. SURFACE SOIL CHARACTERIZATION SAMPLE LOCATIONS, LEHR SOUTHWEST TRENCHES AREA, UC DAVIS, CALIFORNIA

WEISS ASSOCIATES



LEGEND

— x — x —	LIMITS OF SOUTHWEST TRENCHES R.A. AREA.
F200 ▲	FIELD SCREENING SAMPLE LOCATION AND SAMPLE ID
2' BGS	DEPTH OF EXCAVATION BELOW GROUND SURFACE
— — — — —	LIMITS OF EXCAVATION

FIGURE 5-2. CHLORDANE EXCAVATION SCREENING SAMPLE LOCATIONS, LEHR SOUTHWEST TRENCHES AREA, UC DAVIS, CALIFORNIA

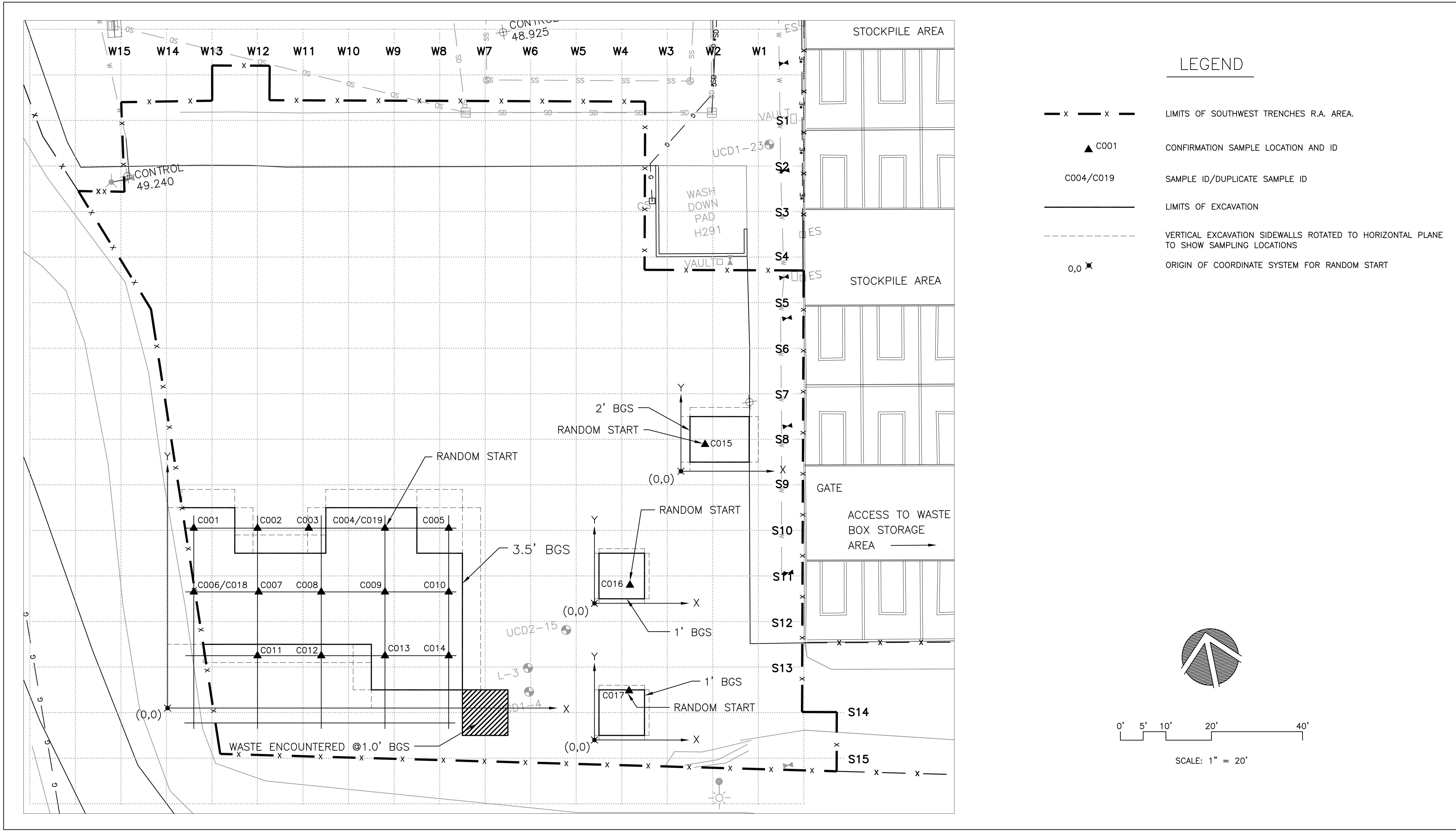


FIGURE 5-3. CHLORDANE EXCAVATION CONFIRMATION SAMPLE LOCATIONS, LEHR SOUTHWEST TRENCHES AREA, UC DAVIS, CALIFORNIA

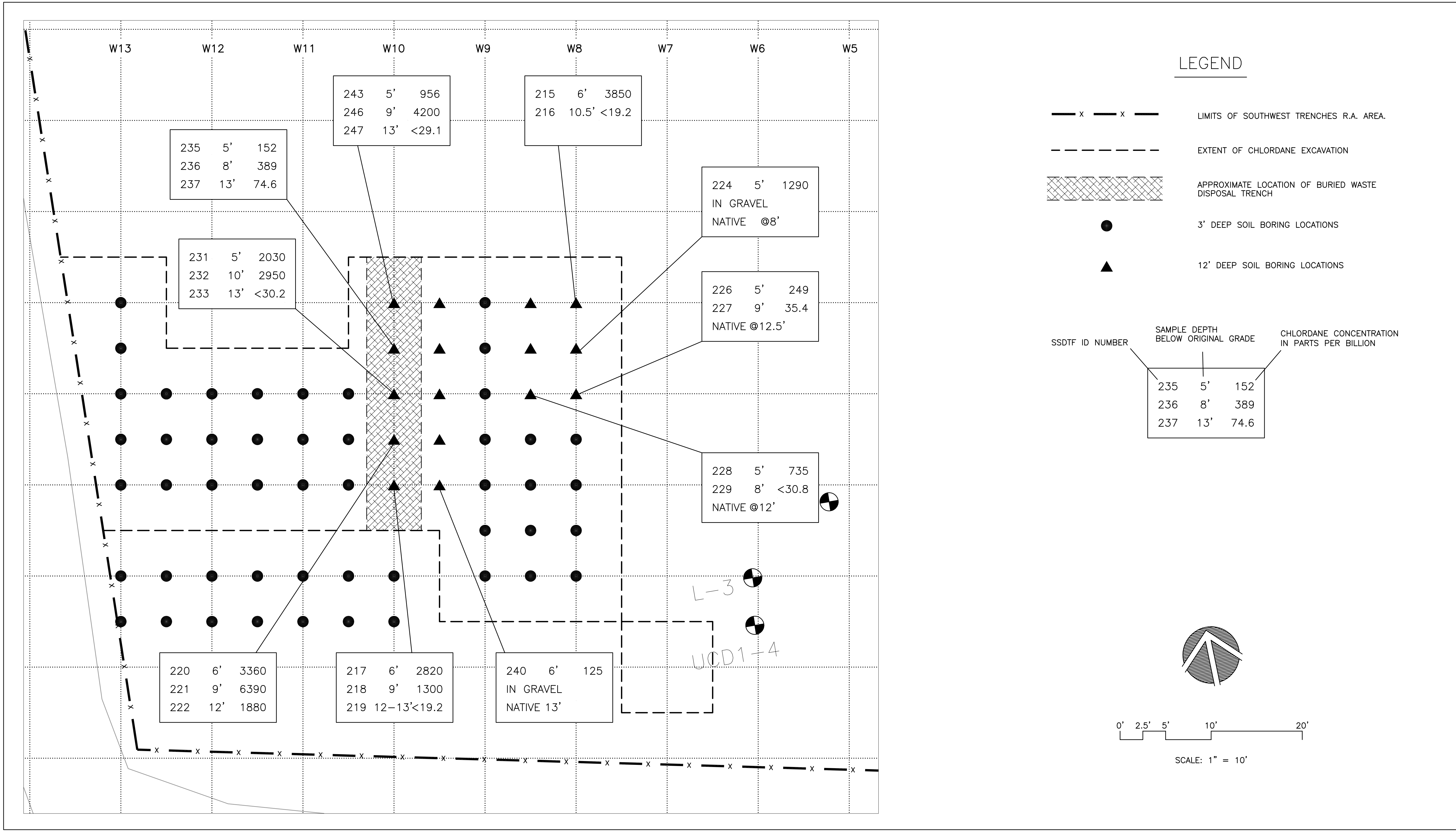


FIGURE 5-4. CHLORDANE DELINEATION SAMPLE LOCATIONS WITHIN WASTE DISPOSAL CELLS, LEHR SOUTHWEST TRENCHES AREA, UC DAVIS, CALIFORNIA

WEISS ASSOCIATES

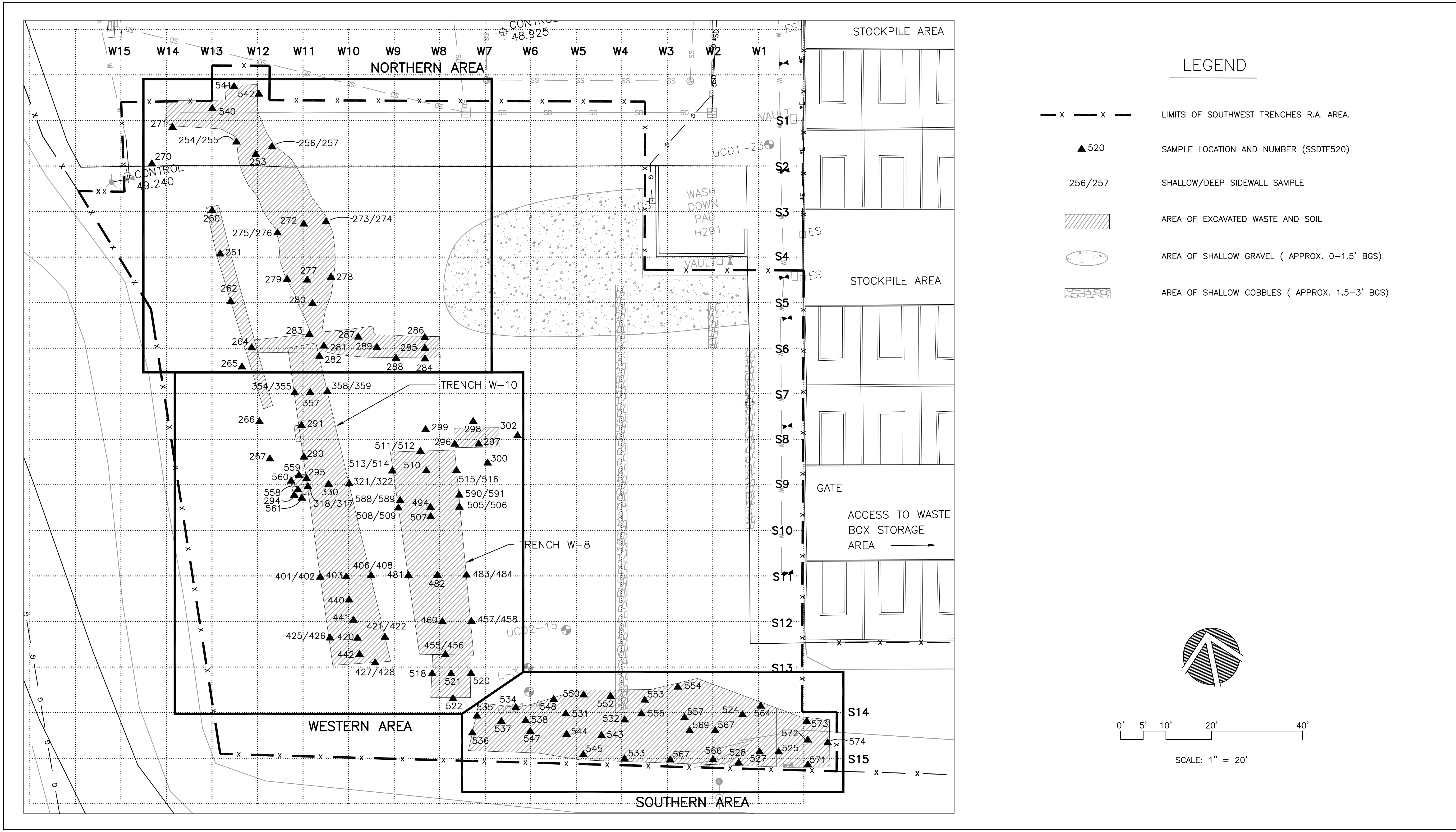


FIGURE 5-5. DISPOSAL CELL EXCAVATION SCREENING SAMPLE LOCATIONS, LEHR SOUTHWEST TRENCHES AREA, UC DAVIS, CALIFORNIA

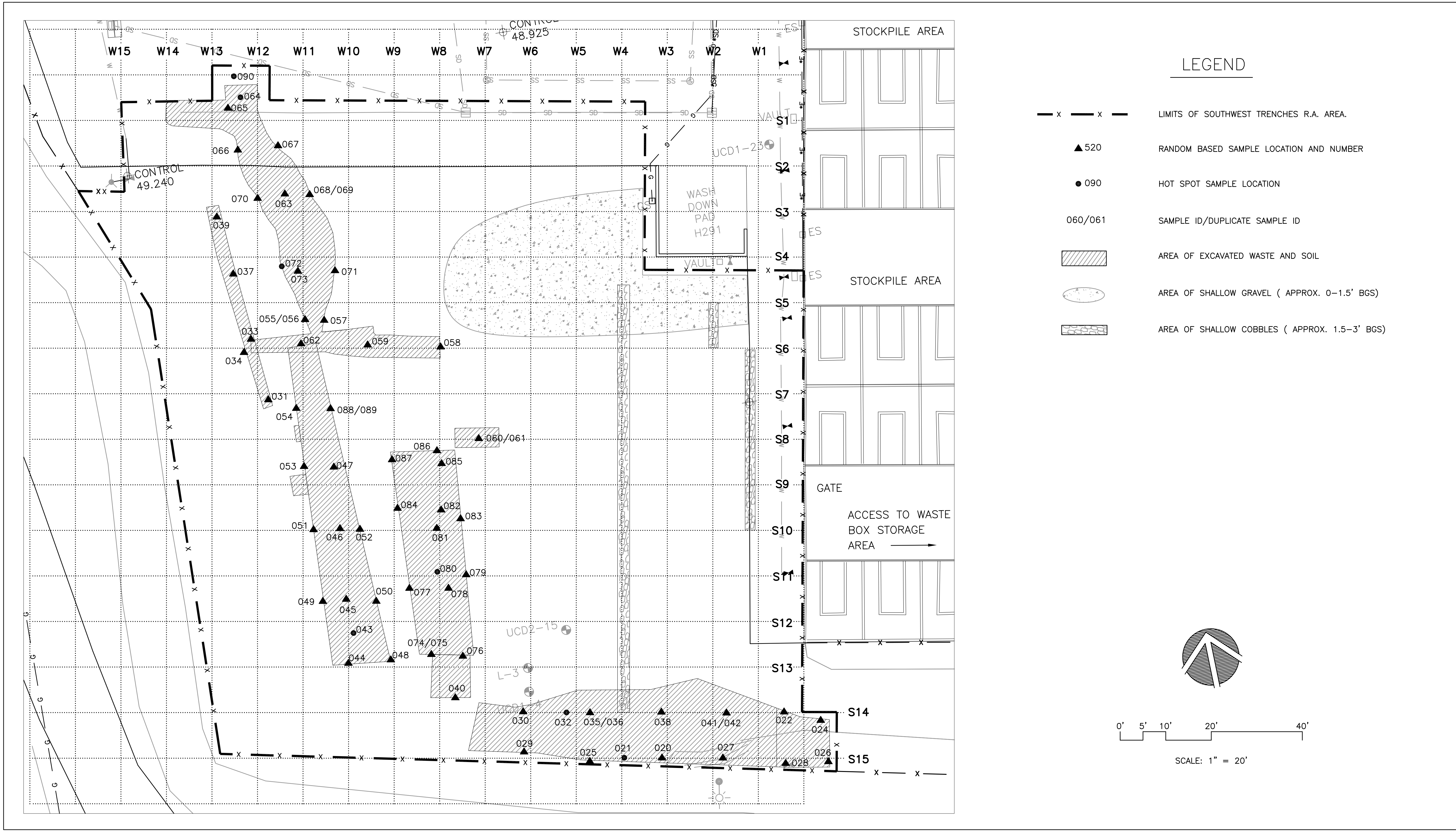


FIGURE 5-6. EXCAVATION CONFIRMATION SAMPLE LOCATIONS, LEHR SOUTHWEST TRENCHES AREA, UC DAVIS, CALIFORNIA

WEISS ASSOCIATES

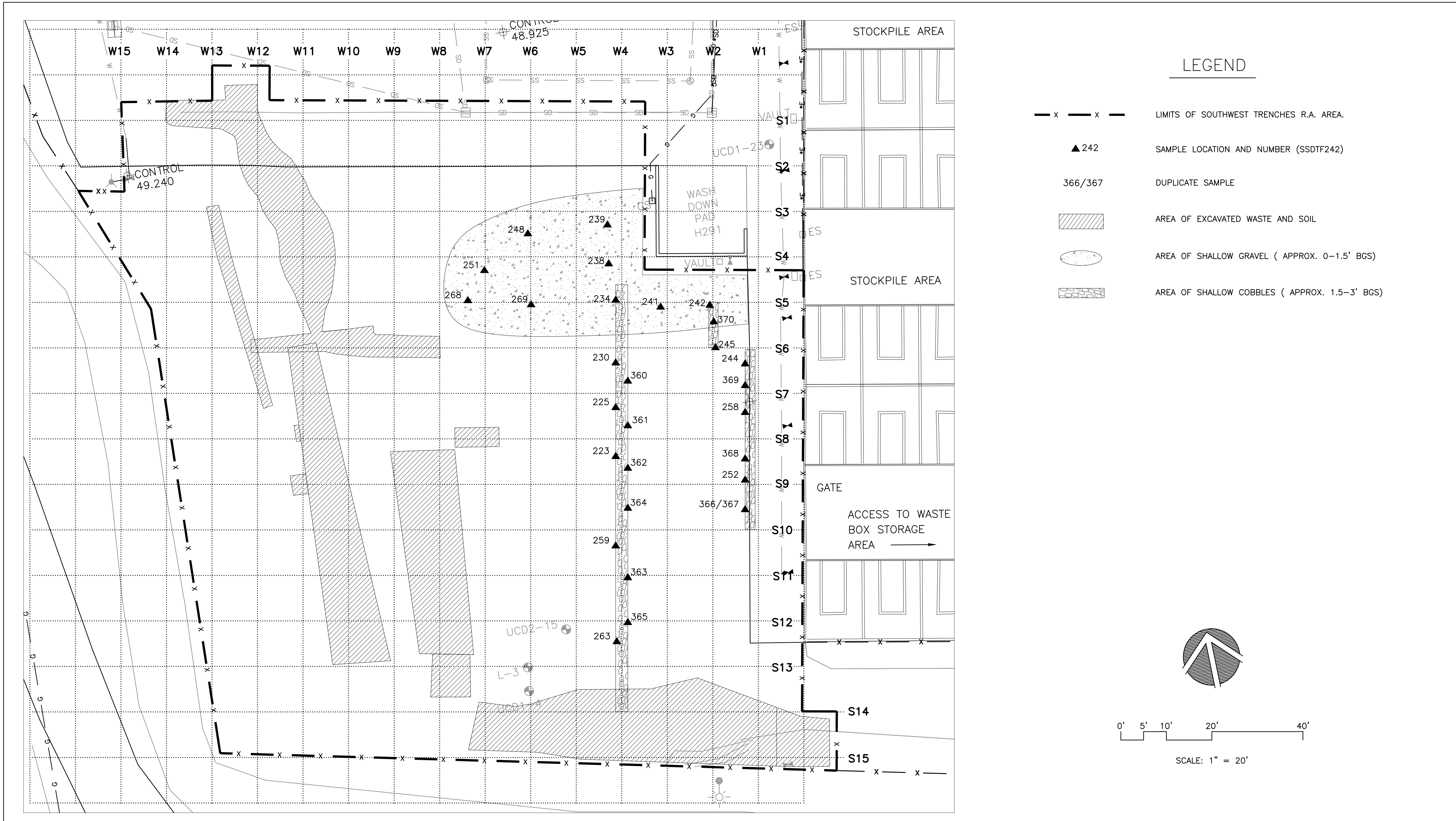


FIGURE 5-7. COBBLE/GRAVEL AREA CHARACTERIZATION SAMPLE LOCATIONS, LEHR SOUTHWEST TRENCHES AREA, UC DAVIS, CALIFORNIA

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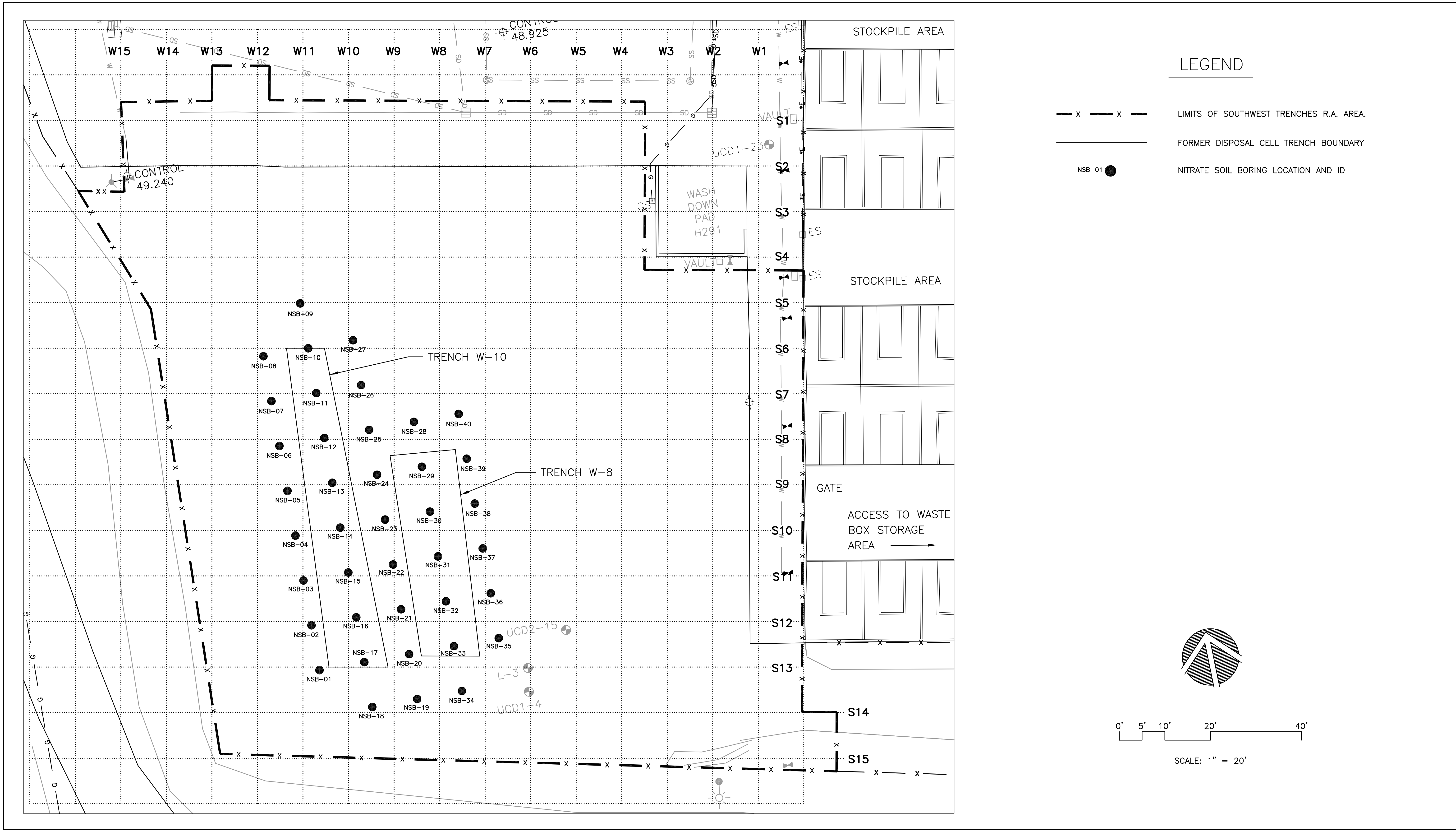

FIGURE 5-8. NITRATE DELINEATION BORING LOCATIONS, LEHR SOUTHWEST TRENCHES AREA, UC DAVIS, CALIFORNIA

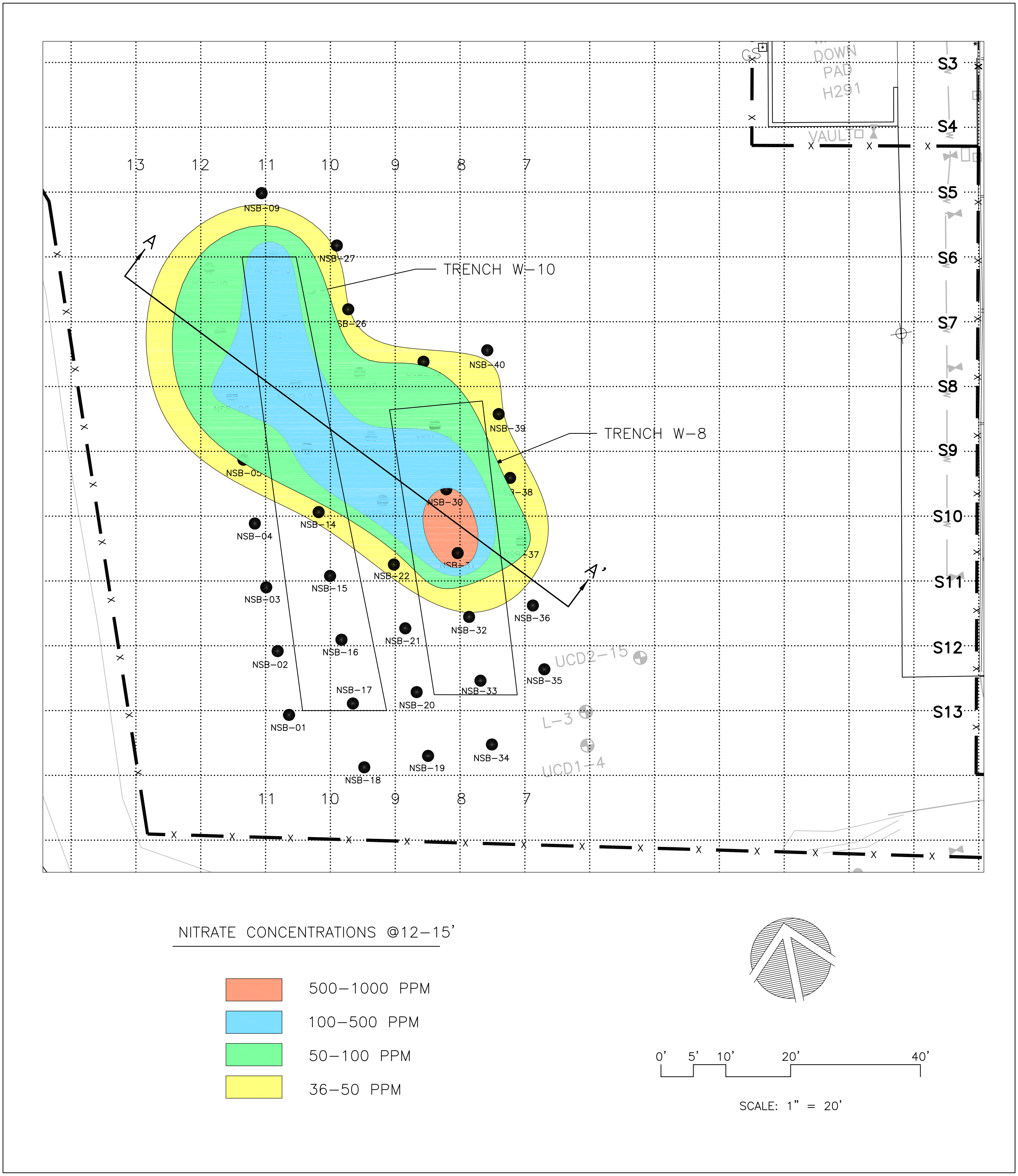

FIGURE 5-9. NITRATE CONCENTRATION CONTOURS AT 12-15' BELOW GROUND SURFACE, LEHR SOUTHWEST TRENCHES AREA, UC DAVIS, CALIFORNIA

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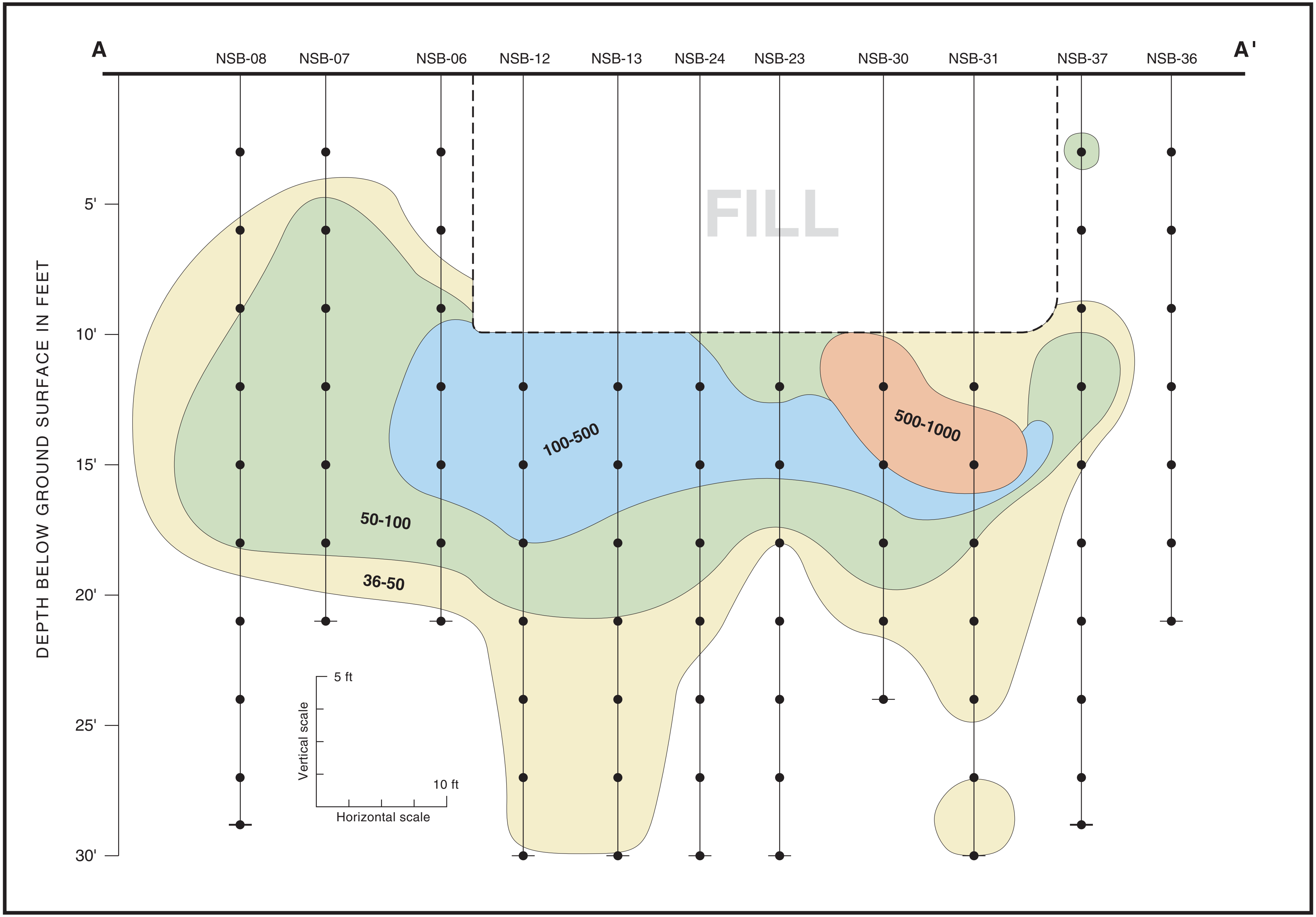

Figure 5-10. Vertical Distribution of Nitrate in Soil Along Section A-A', LEHR Southwest Trenches Area, UC Davis, California

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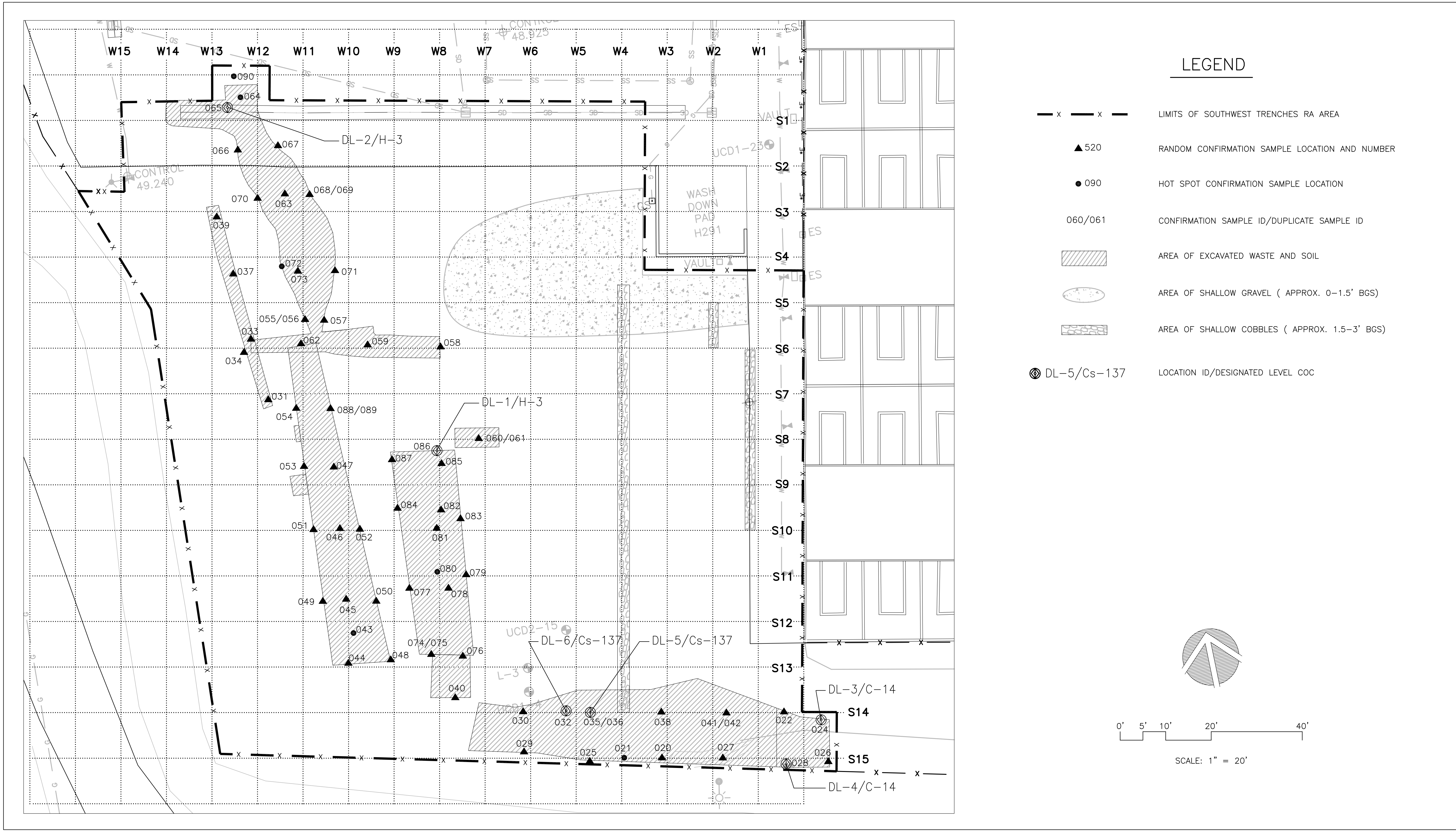
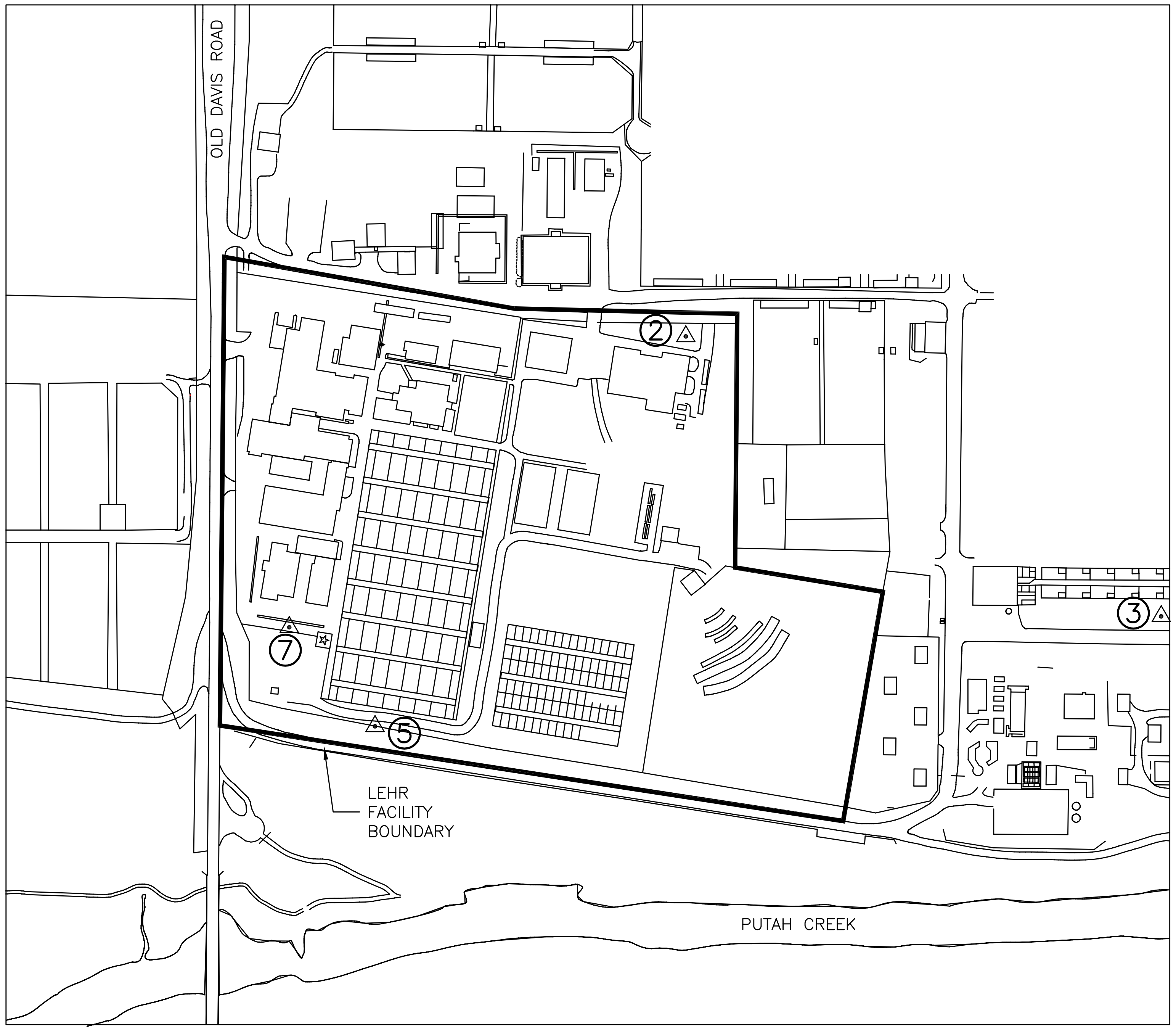


FIGURE 5-11. DESIGNATED LEVEL SOIL BORING LOCATIONS, LEHR SOUTHWEST TRENCHES AREA, UC DAVIS, CALIFORNIA



LEHR SITE PLAN

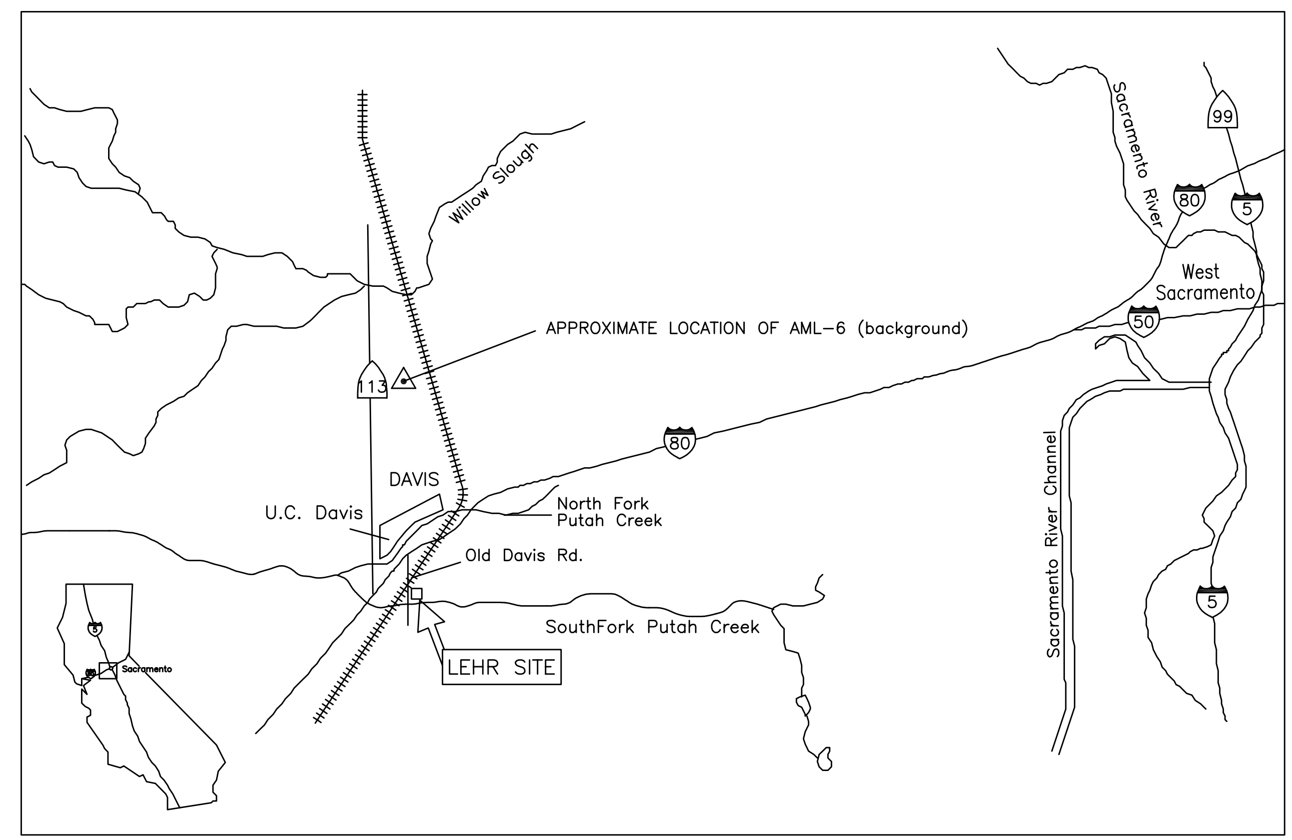
LEGEND

② NORTH PERIMETER AIR MONITORING STATION

③ BACKGROUND AIR MONITORING LOCATION

⑤ SOUTHERN PERIMETER AIR MONITORING LOCATION

⑦ MOBILE AIR MONITORING LOCATION



VICINITY MAP

FIGURE 5-12. AIR MONITORING LOCATION MAP, LEHR SOUTHWEST TRENCHES AREA, UC DAVIS, CALIFORNIA

Table 5-1. Chlordane Surface Soil Characterization Sampling Analytical Results, LEHR Southwest Trenches Area Removal Action

Sample ID	Grid Location	Sample Depth (ft bgs)	Field Chlordane Analytical Result (ppb)	Laboratory Confirmation Chlordane Analytical Result (ppb)
SSDTF001	W10S10	0.5	>2400	NA
SSDTF002	W10S10	1.5	800-2400	NA
SSDTF003	W10S10	3.0	*>2400*	726
SSDTF004	W10S11	0.5	>2400	8,020
SSDTF004-D	W10S11	0.5	>2400	NA
SSDTF005	W10S11	1.5	>2400	NA
SSDTF006	W10S11	3.0	>2400	NA
SSDTF006-D	W10S11	3.0	>2400	NA
SSDTF007	W10S12	0.5	>2400	NA
SSDTF008	W10S12	1.5	*800-2400*	527
SSDTF009	W10S12	3.0	*800-2400*	585
SSDTF010	W10S13	0.5	*800-2400*	268
SSDTF011	W10S13	1.5	160-800	NA
SSDTF012	W10S13	3.0	160-800	NA
SSDTF013	W10S14	0.5	*160-800*	<45
SSDTF014	W10S14	1.5	160-800	NA
SSDTF015	W10S14	3.0	*160-800*	<47
SSDTF016	W11S10	0.5	*800-2400*	591
SSDTF017	W11S10	1.5	<160	NA
SSDTF018	W11S10	3.0	<160	NA
SSDTF019	W11S11	0.5	>2400	NA
SSDTF019-D	W11S11	0.5	>2400	NA
SSDTF020	W11S11	1.5	>2400	NA
SSDTF021	W11S11	3.0	800-2400	NA
SSDTF021	W11S11	3.0	800-2400	NA
SSDTF022	W11S12	0.5	>2400	NA
SSDTF023	W11S12	1.5	>2400	NA
SSDTF024	W11S12	3.0	>2400	11,800
SSDTF025	W11S13	0.5	*800-2400*	262
SSDTF026	W11S13	1.5	160-800	NA
SSDTF027	W11S13	3.0	<160	NA
SSDTF028	W11S14	0.5	*800-2400*	200
SSDTF029	W11S14	1.5	<160	NA
SSDTF030	W11S14	3.0	<160	NA
SSDTF031	W12S10	0.5	800-2400	NA
SSDTF031-D	W12S10	0.5	800-2400	NA
SSDTF032	W12S10	1.5	800-2400	NA
SSDTF033	W12S10	3.0	160-800	NA
SSDTF033-D	W12S10	3.0	160-800	NA
SSDTF034	W12S11	0.5	>2400	NA
SSDTF035	W12S11	1.5	>2400	NA
SSDTF036	W12S11	3.0	800-2400	NA
SSDTF037	W12S12	0.5	>2400	NA

Table 5-1. Chlordane Surface Soil Characterization Sampling Analytical Results, LEHR Southwest Trenches Area Removal Action (continued)

Sample ID	Grid Location	Sample Depth (ft bgs)	Field Chlordane Analytical Result (ppb)	Laboratory Confirmation Chlordane Analytical Result (ppb)
SSDTF037-D1	W12S12	0.5	>2400	NA
SSDTF037-D2	W12S12	0.5	>2400	NA
SSDTF038	W12S12	1.5	800-2400	NA
SSDTF038-D	W12S12	1.5	800-2400	NA
SSDTF039	W12S12	3.0	>2400	NA
SSDTF039-D	W12S12	3.0	>2400	NA
SSDTF040	W12S13	0.5	*800-2400*	704
SSDTF041	W12S13	1.5	160-800	NA
SSDTF042	W12S13	3.0	160-800	NA
SSDTF043	W12S14	0.5	160-800	NA
SSDTF044	W12S14	1.5	160-800	NA
SSDTF045	W12S14	3.0	160-800	NA
SSDTF046	W13S10	0.5	>2400	3,650
SSDTF047	W13S10	1.5	800-2400	897
SSDTF048	W13S10	3.0	<160	509
SSDTF048-D	W13S10	3.0	<160	NA
SSDTF049	W13S11	0.5	>2400	NA
SSDTF050	W13S11	1.5	>2400	NA
SSDTF051	W13S11	3.0	>2400	NA
SSDTF052	W13S12	0.5	>2400	NA
SSDTF053	W13S12	1.5	>2400	NA
SSDTF054	W13S12	3.0	800-2400	NA
SSDTF055	W13S13	0.5	160-800	NA
SSDTF056	W13S13	1.5	<160	NA
SSDTF057	W13S13	3.0	<160	NA
SSDTF058	W13S05	0.5	<160	<58.3
SSDTF059	W13S05	1.5	<160	NA
SSDTF060	W10S05	0.5	*800-2400*	<49.8
SSDTF061	W10S05	1.5	<160	NA
SSDTF062	W07S05	0.5	*800-2400*	94
SSDTF063	W07S05	1.5	160-800	NA
SSDTF064	W04S05	0.5	160-800	NA
SSDTF065	W04S05	1.5	<160	NA
SSDTF066	W02S05	0.5	160-800	NA
SSDTF067	W02S05	1.5	160-800	NA
SSDTF068	W13S08	0.5	<160	NA
SSDTF069	W13S08	1.5	<160	NA
SSDTF070	W10S08	0.5	*800-2400*	496
SSDTF071	W10S08	1.5	*800-2400*	439
SSDTF072	W07S08	0.5	160-800	NA
SSDTF073	W07S08	1.5	160-800	NA
SSDTF074	W04S08	0.5	160-800	NA
SSDTF075	W04S08	1.5	160-800	NA

Table 5-1. Chlordane Surface Soil Characterization Sampling Analytical Results, LEHR Southwest Trenches Area Removal Action (continued)

Sample ID	Grid Location	Sample Depth (ft bgs)	Field Chlordane Analytical Result (ppb)	Laboratory Confirmation Chlordane Analytical Result (ppb)
SSDTF076	W02S08	0.5	800-2400	1,480
SSDTF077	W02S08	1.5	800-2400	1,270
SSDTF078	W07S11	0.5	160-800	NA
SSDTF078-D	W07S11	0.5	160-800	NA
SSDTF079	W07S11	1.5	<160	NA
SSDTF080	W04S11	0.5	800-2400	1,870
SSDTF081	W04S11	1.5	<160	NA
SSDTF082	W02S11	0.5	160-800	NA
SSDTF083	W02S11	1.5	160-800	NA
SSDTF084	W07S14	0.5	>2400	NA
SSDTF085	W07S14	1.5	>2400	3,820
SSDTF086	W04S14	0.5	800-2400	1,610
SSDTF087	W04S14	1.5	<160	NA
SSDTF088	W02S14	0.5	160-800	NA
SSDTF089	W02S14	1.5	<160	NA
SSDTF090	W13S02	0.5	<160	14.9
SSDTF091	W13S02	1.5	<160	NA
SSDTF092	W10S02	0.5	<160	NA
SSDTF093	W10S02	1.5	<160	NA
SSDTF094	W07S02	0.5	<160	NA
SSDTF095	W07S02	1.5	<160	NA
SSDTF096	W04S02	0.5	<160	NA
SSDTF097	W04S02	1.5	<160	NA
SSDTF098	W12S09	0.5	160-800	NA
SSDTF099	W12S09	1.5	<160	NA
SSDTF100	W12S09	3.0	<160	NA
SSDTF101	W11S09	0.5	<160	NA
SSDTF102	W11S09	1.5	<160	NA
SSDTF103	W11S09	3.0	<160	NA
SSDTF104	W10S09	0.5	160-800	NA
SSDTF104-D	W10S09	0.5	160-800	NA
SSDTF105	W10S09	1.5	160-800	NA
SSDTF106	W10S09	3.0	<160	NA
SSDTF107	W09S09	0.5	160-800	NA
SSDTF107-D	W09S09	0.5	160-800	NA
SSDTF108	W09S09	1.5	<160	NA
SSDTF109	W09S09	3.0	160-800	NA
SSDTF110	W09S10	0.5	>2400	3,070
SSDTF110-D	W09S10	0.5	>2400	NA
SSDTF111	W09S10	1.5	160-800	NA
SSDTF112	W09S10	3.0	160-800	NA
SSDTF113	W09S11	0.5	>2400	3,590
SSDTF113-D	W09S11	0.5	>2400	NA

Table 5-1. Chlordane Surface Soil Characterization Sampling Analytical Results, LEHR Southwest Trenches Area Removal Action (continued)

Sample ID	Grid Location	Sample Depth (ft bgs)	Field Chlordane Analytical Result (ppb)	Laboratory Confirmation Chlordane Analytical Result (ppb)
SSDTF114	W09S11	1.5	160-800	NA
SSDTF115	W09S11	3.0	160-800	NA
SSDTF116	W09S12	0.5	>2400	3,740
SSDTF117	W09S12	1.5	*>2400*	2,060
SSDTF118	W09S12	3.0	*>2400*	2,300
SSDTF118-D	W09S12	3.0	>2400	NA
SSDTF119	W13S09	0.5	160-800	NA
SSDTF120	W13S09	1.5	<160	NA
SSDTF121	W08S10	0.5	160-800	NA
SSDTF122	W08S10	1.5	160-800	NA
SSDTF123	W08S11	0.5	>2400	2,550
SSDTF124	W08S11	1.5	160-800	NA
SSDTF125	W08S12	0.5	>2400	NA
SSDTF126	W8S12	1.5	*>2400*	<93.3
SSDTF127	W08S12	3.0	160-800	NA
SSDTF128	W08S13	0.5	>2400	4,620
SSDTF129	W08S13	1.5	*800-2400*	569
SSDTF130	W08S13	3.0	>2400	1,070
SSDTF131	W09S13	0.5	>2400	2,510
SSDTF132	W09S13	1.5	160-800	NA
SSDTF133	W09S13	3.0	<160	NA
SSDTF134	W08S14	0.5	160-800	NA
SSDTF135	W08S14	1.5	160-800	NA
SSDTF136	W07S13	0.5	160-800	NA
SSDTF137	W07S13	1.5	<160	NA
SSDTF138	W07S15	0.5	160-800	459
SSDTF139	W07S15	1.5	<160	NA
SSDTF140	W06S14	0.5	160-800	NA
SSDTF141	W06S14	1.5	<160	NA
SSDTF142	Not analyzed due to poor sample quality			
SSDTF143	W05S11	0.5	160-800	NA
SSDTF143-D	W05S11	0.5	160-800	NA
SSDTF144	W03S11	0.5	160-800	NA
SSDTF145	W04S10	0.5	<160	NA
SSDTF146	W04S12	0.5	160-800	NA
SSDTF147	W05S14	0.5	160-800	NA
SSDTF148	W03S14	0.5	<160	NA
SSDTF149	W04S13	0.5	<160	<57.1
SSDTF150	W04S15	0.5	<160	NA
SSDTF150-D	W04S15	0.5	<160	NA
SSDTF151	W02S07	0.5	160-800	NA
SSDTF152	W02S07	1.5	<160	NA
SSDTF153	W03S08	0.5	<160	<58.4

Table 5-1. Chlordane Surface Soil Characterization Sampling Analytical Results, LEHR Southwest Trenches Area Removal Action (continued)

Sample ID	Grid Location	Sample Depth (ft bgs)	Field Chlordane Analytical Result (ppb)	Laboratory Confirmation Chlordane Analytical Result (ppb)
SSDTF154	W03S08	1.5	<160	NA
SSDTF155	W02S09	0.5	<160	NA
SSDTF156	W02S09	1.5	<160	NA
SSDTF156-D	W02S09	1.5	<160	NA
SSDTF157	W10S04	0.5	160-800	NA
SSDTF158	W11S05	0.5	800-2400	1,260
SSDTF159	W09S05	0.5	160-800	NA
SSDTF160	W10S06	0.5	160-800	NA
SSDTF161	W10S07	0.5	160-800	NA
SSDTF162	W11S08	0.5	*800-2400*	563
SSDTF163	W09S08	0.5	160-800	NA

Notes

Chlordane field analyses conducted by EPA Method 4041(immunoassay-based test kits).
Chlordane laboratory analyses conducted by EPA Method 8080.
Chlordane field Screening Criterion is 800 ppb.
Italics identifies a 'false positive" result (ie. field analytical result >800 ppb with a laboratory confirmation result <800 ppb).
Boldface identifies data points exceeding the Screening Criterion.

Abbreviations

ft bgs feet below ground surface
NA not analyzed
ppb parts per billion

Table 5-2. Radium-226, Cesium-137, and Strontium-90 Surface Soil Characterization Sampling Analytical Results, LEHR Southwest Trenches Area Removal Action

Sample Identification	Collection Date	Radium-226 pCi/g	Radium-226 % error	Cesium-137 pCi/g	Cesium-137 % error	Strontium-90 (pCi/g)	Strontium-90 % error
SSDTF013	5/18/1998	0.431	9%	0.0516	28%	1.0	2.4%
SSDTF014	5/18/1998	0.403	17%	0.0252	100%	1.2	2.4%
SSDTF019	5/18/1998	0.343	10%	0.0555	26%	1.0	2.4%
SSDTF020	5/18/1998	0.390	16%	0.0664	24%	1.3	2.4%
SSDTF049	5/19/1998	0.328	7%	0.0552	26%	0.3	2.5%
SSDTF050	5/19/1998	0.365	8%	0.0286	100%	0.7	2.4%
SSDTF055	5/19/1998	0.404	7%	0.0531	26%	0.9	2.4%
SSDTF056	5/19/1998	0.422	6%	0.0272	100%	0.8	2.4%
SSDTF058	5/19/1998	0.350	7%	0.0351	30%	0.8	2.4%
SSDTF059	5/19/1998	0.328	7%	0.0226	100%	0.5	2.5%
SSDTF060	5/19/1998	0.263	9%	0.0156	100%	0.2	2.5%
SSDTF061	5/19/1998	0.319	6%	0.0201	100%	0.9	2.4%
SSDTF062	5/19/1998	0.263	7%	0.0200	43%	-0.1	2.5%
SSDTF063	5/18/1998	0.260	7%	0.0208	100%	1.1	2.4%
SSDTF064	5/18/1998	0.306	7%	0.0520	27%	0.5	2.5%
SSDTF065	5/19/1998	0.337	12%	0.0244	52%	0.8	2.4%
SSDTF066	5/19/1998	0.252	10%	0.0188	100%	0.7	2.4%
SSDTF067	5/19/1998	0.294	13%	0.0192	100%	0.9	2.4%
SSDTF068	5/19/1998	0.313	7%	0.0264	100%	0.6	2.4%
SSDTF069	5/19/1998	0.347	8%	0.0245	100%	1.1	2.4%
SSDTF070	5/19/1998	0.363	7%	0.0405	24%	0.8	2.4%
SSDTF071	5/19/1998	0.352	6%	0.0283	45%	1.3	2.4%
SSDTF072	5/19/1998	0.345	6%	0.0207	100%	1.1	2.4%
SSDTF073	5/19/1998	0.378	6%	0.0198	100%	1.0	2.4%
SSDTF074	5/19/1998	0.375	9%	0.0671	22%	0.9	2.4%
SSDTF075	5/19/1998	0.345	7%	0.0222	100%	0.5	2.5%
SSDTF076	5/19/1998	0.232	15%	0.0333	31%	0.1	2.5%
SSDTF077	5/19/1998	0.258	7%	0.0223	37%	0.4	2.5%
SSDTF078	5/19/1998	0.359	7%	0.0238	100%	0.8	2.4%
SSDTF079	5/19/1998	0.442	7%	0.0237	100%	0.8	2.4%
SSDTF080	5/19/1998	0.384	13%	0.0255	100%	0.8	2.4%
SSDTF081	5/19/1998	0.009	27%	0.0005	100%	0.4	2.5%
SSDTF082	5/19/1998	0.308	6%	0.0326	29%	0.7	2.4%
SSDTF083	5/19/1998	0.339	6%	0.0206	100%	0.5	2.5%
SSDTF084	5/19/1998	0.429	6%	0.0644	23%	0.8	2.4%
SSDTF085	5/19/1998	0.384	7%	0.0278	100%	0.5	2.5%
SSDTF086	5/19/1998	0.339	7%	0.0881	17%	0.7	2.4%
SSDTF087	5/19/1998	0.389	14%	0.0561	27%	1.0	2.4%
SSDTF088	5/19/1998	0.260	12%	0.0195	100%	0.1	2.4%
SSDTF089	5/19/1998	0.324	15%	0.0202	100%	0.8	2.4%
SSDTF090	5/20/1998	0.349	14%	0.0246	36%	0.8	2.4%
SSDTF091	5/20/1998	0.379	9%	0.0234	100%	0.8	2.4%
SSDTF092	5/20/1998	0.324	7%	0.0224	100%	0.8	2.4%
SSDTF093	5/20/1998	0.314	7%	0.0242	100%	0.9	2.4%
SSDTF094	5/20/1998	0.305	11%	0.0422	27%	0.7	2.4%

Table 5-2. Radium-226, Cesium-137, and Strontium-90 Surface Soil Characterization Sampling Analytical Results, LEHR Southwest Trenches Area Removal Action (continued)

Sample Identification	Collection Date	Radium-226		Cesium-137		Strontium-90	
		pCi/g	% error	pCi/g	% error	(pCi/g)	% error
SSDTF095	5/20/1998	0.311	16%	0.0210	100%	0.7	2.4%
SSDTF096	5/20/1998	0.360	20%	0.0499	31%	0.7	2.4%
SSDTF097	5/20/1998	0.388	6%	0.0264	100%	0.6	2.4%

Notes

Screening Criteria for Radium-226 = 0.75 pCi/g and Strontium-90 = 10 pCi/g.
Cesium-137 is not a driver constituent of concern.

Abbreviation

pCi/g picoCuries per gram

Table 5-3. Chlordane Excavation Screening Sampling Analytical Results, LEHR Southwest Trenches Area Removal Action

Sample Identification	Grid Location	Sample Depth (ft bgs)	Field Chlordane Analytical Result (ppb)	Laboratory Confirmation Chlordane Analytical Result (ppb)
SSDTF164	W1.5S8	1	<160	NA
SSDTF165	W2S7.5	1	800-2400	1140
SSDTF166	W2.5S8	1	<160	NA
SSDTF167	W2S8	2.5	<160	NA
SSDTF167-D	W2S8	2.5	<160	NA
SSDTF168	W2S8.5	1	<160	NA
SSDTF169	W4S10.5	1	160-800	NA
SSDTF170	W4.5S11	1	<160	NA
SSDTF171	W4S11	1.5	<160	NA
SSDTF171-D	W4S11	1.5	160-800	NA
SSDTF172	W3.5S11	1	160-800	NA
SSDTF173	W4S11.5	1	<160	NA
SSDTF174	W4S13.5	1	<160	NA
SSDTF175	W4.5S14	1	800-2400	NA
SSDTF176	W4S14	1.5	160-800	NA
SSDTF176-D	W4S14	1.5	<160	NA
SSDTF177	W3.5S14	1	160-800	NA
SSDTF178	W4S14.5	1	160-800	NA
SSDTF179	W13S10	4	<160	NA
SSDTF180	W13S11	4	<160	NA
SSDTF181	W13S12	4	<160	NA
SSDTF181-D	W13S12	4	<160	NA
SSDTF182	W12S11	4	160-800	NA
SSDTF183	W12S12	4	160-800	NA
SSDTF184	W11S11	4	~160	NA
SSDTF185	W11S12	4	160-800	NA
SSDTF186	W10S10	4	160-800	NA
SSDTF187	W10S11	4	800-2400	NA
SSDTF188	W10S12	4	>2400	NA
SSDTF188-D	W10S12	4	>2400	NA
SSDTF189	W09S10	4	~2400	NA
SSDTF190	W09S11	4	160-800	NA
SSDTF191	W09S12	4	>2400	NA
SSDTF192	W09S13	4	<160	NA
SSDTF192-D	W09S13	4	<160	NA
SSDTF193	W08S11	4	800-2400	NA
SSDTF194	W08S12	4	160-800	NA
SSDTF195	W08S13	4	<160	NA
SSDTF196	W13S9.5	2	<160	NA
SSDTF197	W12.5S10	2	800-2400	NA
SSDTF198	W11.5S10.5	2	160-800	NA
SSDTF199	W10.5S10	2	<160	NA
SSDTF200	W9.5S9.5	2	800-2400	NA
SSDTF201	W8.5S10	2	>2400	NA

Table 5-3. Chlordane Excavation Screening Sampling Analytical Results, LEHR Southwest Trenches Area Removal Action (continued)

Sample Identification	Grid Location	Sample Depth (ft bgs)	Field Chlordane Analytical Result (ppb)	Laboratory Confirmation Chlordane Analytical Result (ppb)
SSDTF201-D	W8.5S10	2	>2400	NA
SSDTF202	W8S10.5	2	>2400	NA
SSDTF203	W7.5S11.5	2	<160	NA
SSDTF204	W2.5S12.5	2	<160	NA
SSDTF205	W8.5S13.5	2	<160	NA
SSDTF206	W9.5S13	2	~160	NA
SSDTF207	W10.5S12.5	2	<160	NA
SSDTF208	W12.5S12.5	2	<160	NA
SSDTF209	W8.5S9.5	2	<160	NA
SSDTF210	W7.5S9.5	2	<160	NA
SSDTF210-D	W7.5S9.5	2	<160	NA
SSDTF211	W7.5S10.5	2	<160	NA

Notes

Chlordane field analyses conducted by EPA Method 4041(immunoassay-based test kits).
Chlordane laboratory analyses conducted by EPA Method 8080.
Chlordane field Screening Criterion is 800 ppb.
Boldface identifies data points exceeding the Screening Criterion.

Abbreviations

ft bgs feet below ground surface
NA not analyzed
ppb parts per billion

Table 5-4. Chlordane Excavation Confirmation Sampling Analytical Results, LEHR Southwest Trenches Area Removal Action

COC	Number of Detections	Maximum Detected Concentration (µg/kg)	Location of Maximum	Depth of Maximum (ft bgs)
4,4'-DDE	2	1.7 J	SSDTC006	4
4,4'-DDT	2	6.4 J	SSDTC006	4
alpha-Chlordane	16	96.9 J	SSDTC008	4
Endrin	1	6 J	SSDTC005	4
Gamma-BHC	1	0.58 J	SSDTC001	4
gamma-Chlordane	18	152	SSDTC008	4
Heptachlor	13	42.5	SSDTC008	4
Heptachlor Epoxide	12	3.8	SSDTC004	4

Abbreviations

ft bgs feet below ground surface
J Data validation qualifier; the compound was detected below the reporting limit and the concentration reported was estimated.
µg/kg micrograms per kilogram

Table 5-5. Chlordane Delineation Sampling Analytical Results from Southwest Corner Waste Disposal Cells, LEHR Southwest Trenches Area Removal Action

Sample ID	Grid Location	Sample Depth (ft bgs)	Soil Type	Sample / Lithology Info	Date / Time	Chlordane (EPA 8080) (ppb)	Chlordane (TCLP) (mg/L)
SSDTF215	W8, S10	6.0	gravelly Silt	gravel at 1.5' / poor recovery	7-16-98 / 1435	3850	0.0277
SSDTF216	W8, S10	10.5	clayey Silt	native soil at 7.0'	7-16-98 / 1553	<19.2	NA
SSDTF217	W10,S12	6.0	gravelly Silt	gravel at 1.5' / poor recovery	7/17/98 / 7:30	2820	0.0169
SSDTF218	W10,S12	9.0	gravel	wood and discoloration /rad activity	7/17/98 / 8:32	1300	0.0064
SSDTF219	W10,S12	12.0	clayey silt	native at 9.0 / no activity	7/17/98 / 8:44	<19.2	NA
SSDTF220	W10,S11.5	6.0	silty gravel	gravel at 2.0'	7/17/98 / 9:17	3360	0.00835
SSDTF221	W10,S11.5	9.0	gravel	wood and discoloration	7/17/98 / 9:42	6390	0.0272
SSDTF222	W10,S11.5	12.0	gravel	gravel blocking shoe / poor recovery	7/17/98 / 11:05	1880	0.0142
SSDTF224	W8,S10.5	6.0	gravely silt	gravel at 2.0' / poor recovery	7/20/98 / 6:23	1290	<0.0125
SSDTF226	W8,S11	6.5	gravely silt	gravel at 1.5'	7/20/98 / 6:54	249	NA
SSDTF227	W8,S11	9.5	clayey silt	native soil at 6.0'	7/20/98 / 7:10	35.4	NA
SSDTF228	W8.5, S11	5.0	silty gravel	gravel and plastic at 1.0'	7/20/98 / 7:26	735	NA
SSDTF229	W8.5, S11	9.0	clayey silt	native at 5.0'	7/20/98 / 7:32	<51.6	NA
SSDTF231	W10, S11	6.0	clayey silt / gravel	gravel at 0.5'	7/20/98 / 7:57	2030	<0.0125
SSDTF232	W10, S11	10.0	gravel	poor recovery	7/20/98 / 8:14	2950	0.01
SSDTF233	W10, S11	13.5	clayey silt	native at 10.0'	7/20/98 / 8:20	<50.6	NA
SSDTF235	W10, S10.5	5.5	gravel dup run	red and white discoloration at 4.7'	7/20/98 / 10:14	152	NA
SSDTF236	W10, S10.5	8.5	gravel	red and white discoloration at 4.7'	7/20/98 / 10:33	422	NA
SSDTF237	W10, S10.5	13.0	clayey silt dup run	native at 10.0'	7/20/98 / 12:40	74.6	NA
SSDTF240	W12, S9.5	6.0	gravely sand	gravel at 1.5'	7/20/98 / 1452	125	NA
SSDTF243	W10, S10	6.0	Silty gravel	gravel at 1.5'	7-21-98 / 0951	956	0.0077
SSDTF246	W10, S10	9.5	Silty gravel	poor recovery	7-21-98 / 1006	4200	0.0168
SSDTF247	W10, S10	13.0	clayey silt	native soil contact uncertain	7-21-98 / 1031	<48.8	NA
SSDTF249	W10, S10.5	13.0	clayey silt	SSDTF237 field dup	7-20-98 / 1240	37.6	NA
SSDTF250	W10, S10.5	5.5	gravel	SSDTF235 field dup	7-20-98 / 1033	876	NA

Abbreviations

dup duplicate
EPA U.S. Environmental Protection Agency
mg/L milligrams per liter
NA not available
ppb parts per billion
TCLP

Table 5-6. Northern and Western Excavation Area Screening Sampling Analytical Results, LEHR Southwest Trenches Area Removal Action

Sample ID	Grid Location (1)	Sample Depth (ft bgs)	Soil Type / Excavation Location	Date / Time	Total Chlordanes (μg/kg) (2)	Hg (mg/kg) (3)	Cr+6 (mg/kg) (3)	NO3 (mg/kg) (3)	Ra-226 (pCi/g) (4)	Lab Ra-226 %RPD (7)	Field Ra-226 %RPD (8)	Ra-226 Error +/-	Sr-90 (pCi/g) (5)	Sr-90 Error (+/-)	Field Sr-90 %RPD (8)
Screening Criteria (6)					**800 μg/kg**	**3.1 mg/kg (9)**	**3.8 mg/kg**	**36 mg/kg**	**0.75 pCi/g**				**10 pCi/g**		
Northern Disposal Cell Excavations															
SSDTF253	W12.3, S1.8	12.0	Clayey Silt / Trench Floor	7-22-98 / 07:35	<160	0.34	<0.0452	16.6	0.343	-	-	0.026	2.90	0.064	-
SSDTF254	W12.8, S1.8	11.0	Clayey Silt / West Sidewall	7-22-98 / 07:45	<160	0.613	0.088	2.35	0.333	-	-	0.034	0.60	0.014	-
SSDTF255	W12.8, S1.8	6.0	Clayey Silt / West Sidewall	7-22-98 / 07:50	<160	1.05	0.137	0.821	0.346	-	-	0.026	1.20	0.029	-
SSDTF256	W11.8, S1.6	11.0	Clayey Silt / East Sidewall	7-22-98 / 07:55	<160	0.349	0.2	4.4	0.345	-	-	0.062	1.30	0.030	-
SSDTF257	W11.8, S1.6	6.0	Clayey Silt / East Sidewall	7-22-98 / 08:00	<160	1.00	0.264	<0.164	0.347	-	-	0.061	0.60	0.014	-
SSDTF260	W13, S3	6.0	Sandy Silt / Trench Floor	7-23-98 / 06:25	NA	NA	NA	NA	0.307	-	-	0.051	1.50	0.035	-
SSDTF261	W12.8, S4	3.5	Sandy Silt / Trench Floor	7-23-98 / 06:35	NA	NA	NA	NA	0.305	-	-	0.051	1.10	0.026	-
SSDTF262	W12.5, S5	3.5	Sandy Silt / Trench Floor	7-23-98 / 06:45	NA	NA	NA	NA	0.343	-	-	0.038	0.80	0.019	-
SSDTF264	W12, S6	3.5	Silty Sand / Trench Floor	7-23-98 / 08:10	NA	NA	NA	NA	0.324	-	-	0.024	0.50	0.013	-
SSDTF265	W12.3, S6.5	3.5	Silty Sand / Trench Floor	7-23-98 / 09:45	NA	NA	NA	NA	0.311	-	-	0.063	0.80	0.019	-
SSDTF266	W12, S7.5	3.5	Silty Sand / Trench Floor	7-23-98 / 09:50	NA	NA	NA	NA	0.316	-	-	0.043	1.10	0.026	-
SSDTF267	W11.8, S8.5	3.5	Silty Sand / Trench Floor	7-23-98 / 09:55	NA	NA	NA	NA	0.319	-	-	0.036	0.80	0.019	-
SSDTF270	W14.5, S2	3.5	Silty Sand / Trench Floor	7-24-98 / 09:11	<160	1.21	0.053	11.2	0.349	-	-	0.022	1.10	0.026	-
SSDTF271	W14, S1.5	3.0	Sandy Silt / Trench Floor	7-24-98 / 09:22	<160	1.16	<0.0428	5.17	0.322	-	-	0.022	1.00	0.024	-
SSDTF272	W11, S3.5	12.0	Clayey Silt / Trench Floor	7-27-98 / 09:52	<160	0.0714	<0.0452	27.4	0.365	-	-	0.048	2.20	0.048	-
SSDTF273	W10.3, S3.4	10.0	Clayey Silt / East Sidewall	7-27-98 / 10:05	<160	0.11	<0.046	11.2	0.306	-	-	0.030	1.30	0.030	-
SSDTF274	W10.3, S3.4	5.0	Clayey Silt / East Sidewall	7-27-98 / 10:13	<160	0.601	<0.0452	0.93	0.289	-	-	0.041	0.90	0.022	-
SSDTF275	W11.7, 3.6	10.0	Clayey Silt / West Sidewall	7-27-98 / 10:21	<160	0.33	<0.0448	0.517	0.345	-	-	0.075	1.00	0.024	-
SSDTF276	W11.7, S3.6	5.0	Silty Sand / West Sidewall	7-27-98 / 10:31	<160	0.257	<0.0424	<0.135	0.336	-	-	0.023	1.10	0.026	-
SSDTF277	W10.9, S4.5	12.0	Sandy Silt / Trench Floor	7-28-98 / 10:00	<160	0.118	0.0696	<0.151	0.365	-	-	0.039	1.30	0.030	-
SSDTF278	W10.2, S4.5	7.0	Silty Sand / East Sidewall	7-28-98 / 10:05	<160	0.652	<0.0440	1.67	0.345	-	-	0.043	1.00	0.024	-
SSDTF278 -R	**Ra-226 Re-analysis following 21-day ingrowth**				NA	NA	NA	NA	0.372	108	-	0.032	NA	NA	-
SSDTF279	W11.5, S4.5	7.0	Clayey Silt / West Sidewall	7-28-98 / 10:09	<160	0.243	<0.0444	0.403	0.337	-	-	0.076	1.30	0.030	-
SSDTF280	W10.9, S4.7	6.5	Clayey Silt / South Sidewall	7-28-98 / 10:14	<160	0.631	0.0872	2.41	0.332	-	-	0.023	0.80	0.019	-
SSDTF281	W10.5, S6	4.0	Silty Sand / Trench Floor	7-28-98 / 11:51	<160	2.01	0.102	1.66	0.366	-	-	0.025	1.10	0.026	-
SSDTF282	W10.5, S6.1	3.0	Silty Sand / South Sidewall	7-28-98 / 13:55	<160	0.328	0.148	0.749	0.269	-	-	0.022	0.80	0.019	-
SSDTF283	W10.5, S5.9	3.0	Silty Sand / North Sidewall	7-28-98 / 13:59	<160	1.63	<0.0428	1.11	0.313	-	-	0.025	0.80	0.019	-
SSDTF283 -R	**Ra-226 Re-analysis following 21-day ingrowth**				NA	NA	NA	NA	0.374	119	-	0.031	NA	NA	-
SSDTF284	W8.5, S6.3	3.0	Silty Sand / South Sidewall	7-29-98 / 07:35	<160	0.421	0.209	1.28	0.328	-	-	0.029	1.10	0.026	-
SSDTF285	W8.5, S6	4.0	Silty Sand / Trench Floor	7-29-98 / 07:45	160-800	1.03	<0.0440	6.63	0.335	-	-	0.034	1.20	0.029	-
SSDTF286	W8.5, S5.7	3.0	Silty Sand / North Sidewall	7-29-98 / 07:40	<160	1.01	0.0904	0.707	0.314	-	-	0.025	0.70	0.017	-
SSDTF287	W9.5, S5.5	3.5	Clayey Silt / North Sidewall	7-29-98 / 13:31	NA	NA	NA	NA	0.416	-	-	0.035	0.90	0.022	-
SSDTF288	W9.0, S6.3	3.5	Silty Sand / South Sidewall	7-29-98 / 13:38	NA	NA	NA	NA	0.357	-	-	0.059	0.90	0.022	-
SSDTF289	W9.2, S6	4.0	Silty Sand / Trench Floor	7-29-98 / 13:43	NA	NA	NA	NA	0.383	-	-	0.068	1.20	0.029	-
SSDTF289 -R	**Ra-226 Re-analysis following 21-day ingrowth**				NA	NA	NA	NA	0.391	102	-	0.064	NA	NA	-
SSDTF293	**Lab Spike**	NA	**Silt / Sr-90, @126.1(pCi/g)**	7-31-98 / 08:25	NA	NA	NA	NA	0.308	-	-	0.021	130.70	0.784	-
SSDTF540	W13.1, S0.9	10.0	Sandy Silt / West Sidewall	8-24-98 / 05:17	<160	0.265	0.131	16.2	0.334	-	-	0.334	1.50	0.035	-
SSDTF541	W12.6, S0.9	10.0	Silty Sand / South Sidewall	8-24-98 / 05:19	<160	1.19	0.194	3.63	0.355	-	-	0.355	7.60	0.137	-
SSDTF542	W12.1, S0.7	10.0	Sandy Silt / North Sidewall Corner	8-24-98 / 05:22	<160	0.933	0.26	8.84	0.322	-	-	0.322	1.70	0.039	-
Western Disposal Cell Excavations															
SSDTF290	W11, S8.2	3.5	Silty Sand and Gravel / West Sidewall	7-30-98 / 07:55	160-800	1.25	<0.0440	8.75	0.268	-	-	0.020	1.00	0.024	-
SSDTF291	W11, S7.8	3.5	Silty Sand and Gravel / West Sidewall	7-31-98 / 08:03	160-800	0.431	<0.0432	9.71	0.33	-	-	0.030	1.20	0.029	-
SSDTF292	W11, S7.8	3.5	**Field Duplicate of SSDTF291**	7-31-98 / 08:12	160-800	0.743	<0.0428	10.4	0.32	-	-3	0.022	1.10	0.026	-9
SSDTF292 -R	**Ra-226 Re-analysis following 21-day ingrowth**				NA	NA	NA	NA	0.43	134	-	0.026	NA	NA	-
SSDTF294 **	*W11.2, S9*	*4.0*	*Silty Sand / Trench Floor*	*7-31-98 / 08:40*	***>2400***	*0.509*	*<0.0428*	*2.54*	*0.337*	-	-	*0.066*	*0.90*	*0.022*	-
SSDTF294 -R	***Ra-226 Re-analysis following 21-day in-growth***				*NA*	*NA*	*NA*	*NA*	*0.434*	-	-	*0.051*	*NA*	*NA*	-
SSDTF295	W10.8, S9	4.0	Silty Sand / Trench Floor	7-31-98 / 08:50	<160	0.822	<0.0424	2.66	0.359	-	-	0.066	1.00	0.024	-
SSDTF296	W8, S8	6.0	Clayey Silt / Trench Floor	8-3-98 / 07:34	<160	1.55	<0.0472	**75.3**	0.309	-	-	0.069	0.80	0.019	-

Table 5-6. Northern and Western Excavation Area Screening Sampling Analytical Results, LEHR Southwest Trenches Area Removal Action (continued)

Sample ID	Grid Location (1)	Sample Depth (ft bgs)	Soil Type / Excavation Location	Date / Time	Total Chlordanes (µg/kg) (2)	Hg (mg/kg) (3)	Cr+6 (mg/kg) (3)	NO3 (mg/kg) (3)	Ra-226 (pCi/g) (4)	Lab Ra-226 %RPD (7)	Field Ra-226 %RPD (8)	Ra-226 Error +/-	Sr-90 (pCi/g) (5)	Sr-90 Error (+/-)	Field Sr-90 %RPD (8)
Screening Criteria (6)					**800 µg/kg**	**3.1 mg/kg (9)**	**3.8 mg/kg**	**36 mg/kg**	**0.75 pCi/g**				**10 pCi/g**		
SSDTF297	W7.2, S8.2	6.0	Clayey Silt / Trench Floor	8-3-98 / 07:42	<160	0.311	<0.0468	**59**	0.349	-	-	0.121	1.10	0.026	-
SSDTF297 -R	**Ra-226 Re-analysis following 21-day in-growth**				NA	NA	NA	NA	0.409	117	-	0.024	NA	NA	-
SSDTF298	W7.2, S8.5	5.0	Silty Sand / North Sidewall	8-3-98 / 07:54	<160	0.725	0.108	21.3	0.218	-	-	0.051	1.00	0.024	-
SSDTF298 -R	**Ra-226 Re-analysis following 21-day ingrowth**				NA	NA	NA	NA	0.34	156	-	0.033	NA	NA	-
SSDTF299	W7.8, S8.3	5.0	Silty Sand / West Sidewall	8-3-98 / 08:00	<160	0.329	0.159	27.5	0.202	-	-	0.024	1.20	0.029	-
SSDTF299 -R	**Ra-226 Re-analysis following 21-day ingrowth**				NA	NA	NA	NA	0.376	186	-	0.027	NA	NA	-
SSDTF300	W7.0, S8.3	5.0	Silty Sand / South Sidewall	8-3-98 / 08:10	160-800	0.423	<0.0436	6.26	0.192	-	-	0.020	0.90	0.022	-
SSDTF300 -R	**Ra-226 Re-analysis following 21-day ingrowth**				NA	NA	NA	NA	0.363	189	-	0.023	NA	NA	-
SSDTF301	W7.0, S8.3	5.0	**Field Duplicate of SSDTF300**	8-3-98 / 08:10	160-800	0.586	<0.0436	7.08	0.268	-	33	0.029	1.10	0.026	20
SSDTF301 -R	**Ra-226 Re-analysis following 21-day ingrowth**				NA	NA	NA	NA	0.334	125	-8	0.021	NA	NA	-
SSDTF302	W6.5, S7.8	5.0	Silty Sand / East Sidewall	8-3-98 / 08:19	160-800	0.813	<0.0436	15.3	0.329	-	-	0.056	1.10	0.026	-
SSDTF317	W10.5, S9	10.0	Silty Sand / West Sidewall	8-5-98 / 05:57	160-800	0.165	0.0928	**346**	0.412	-	-	0.026	1.30	0.031	-
SSDTF318	W10.5, S9	5.0	Sandy Silt / West Sidewall	8-5-98 / 05:59	160-800	0.69	0.0735	**103**	0.362	-	-	0.039	1.50	0.035	-
SSDTF321	W9.5, S9	5.0	Silty Sand / West Sidewall	8-5-98 / 06:20	<160	0.284	<0.0424	**119**	0.355	-	-	0.106	1.40	0.032	-
SSDTF322	W9.5, S9	10.0	Sandy Silt / West Sidewall	8-5-98 / 06:24	160-800	0.134	<0.0464	**359**	0.41	-	-	0.073	0.80	0.019	-
SSDTF330	W10, S9	13.0	Clayey Silt / Trench Floor	8-5-98 / 08:40	160-800	0.116	<0.0456	**582**	0.425	-	-	0.024	1.70	0.039	-
SSDTF354	W11.2, S7	5.0	Sandy Silt / West Sidewall	8-6-98 / 10:31	160-800	0.803	<0.0456	**60.5**	0.352	-	-	0.023	0.80	0.019	-
SSDTF355	W11.2, S7	10.0	Clayey Silt / West Sidewall	8-6-98 / 10:33	<160	0.16	<0.0476	**82.6**	0.364	-	-	0.091	0.60	0.014	-
SSDTF356	W11.2, S7	10.0	**Field Duplicate of SSDTF355**	8-6-98 / 10:33	<160	0.167	0.058	**71.9**	0.356	-	-2	0.095	0.80	0.019	29
SSDTF357	W10.8, S7	12.0	Clayey Silt / Trench Floor	8-6-98 / 10:38	<160	0.169	<0.0468	**404**	0.354	-	-	0.093	1.40	0.032	-
SSDTF358	W10.5, S7	5.0	Clayey Silt / East Sidewall	8-6-98 / 10:41	<160	0.507	<0.0444	28.2	0.351	-	-	0.049	0.90	0.022	-
SSDTF359	W10.5, S7	10.0	Sandy Silt / East Sidewall	8-6-98 / 10:47	<160	0.194	0.129	**219**	0.34	-	-	0.023	0.50	0.013	-
SSDTF401	W10.5, S11	5.0	Silty Sand / West Sidewall	8-10-98 / 13:06	160-800	0.465	<0.044	**49.4**	0.319	-	-	0.061	1.10	0.026	-
SSDTF402	W10.5, S11	10.0	Sandy Silt / West Sidewall	8-10-98 / 13:10	<160	0.828	<0.0452	**60.1**	0.386	-	-	0.081	1.10	0.026	-
SSDTF403	W10, S11	12.0	Clayey Silt / Trench Floor	8-10-98 / 13:15	**800-2400 (670)**	0.321	<0.0476	**363**	0.424	-	-	0.047	0.70	0.017	-
SSDTF406	W9.5, S11	5.0	Silty Sand / East Sidewall	8-11-98 / 05:10	<160	0.241	0.199	10.5	0.319	-	-	0.022	0.90	0.022	-
SSDTF407	W9.5, S11	5.0	**Field Duplicate of SSDTF406**	8-11-98 / 05:16	<160	0.215	0.139	11	0.305	-	-4	0.023	0.80	0.019	-12
SSDTF408	W9.5, S11	10.0	Sandy Silt / East Sidewall	8-11-98 / 05:23	<160	0.183	0.25	**70.4**	0.408	-	-	0.027	0.70	0.017	-
SSDTF420 **	*W10, S12.3*	*11.0*	*Clayey Silt / Trench Floor*	*8-12-98 / 05:10*	*<160 (<56.3)*	*0.186*	*0.0798*	*1.86*	*0.333*	-	-	*0.021*	***25.60***	*0.307*	-
SSDTF421	W9.7, S12.3	10.0	Clayey Silt / East Sidewall	8-12-98 / 05:20	<160 (<56.9)	0.153	0.103	0.683	0.337	-	-	0.041	1.20	0.029	-
SSDTF422	W9.6, S12.3	5.0	Sandy Silt / East Sidewall	8-12-98 / 05:35	<160 (<56.9)	0.19	0.148	0.886	0.352	-	-	0.053	1.10	0.026	-
SSDTF423	W9.6, S12.3	5.0	**Field Duplicate of SSDTF422**	8-12-98 / 05:36	<160	0.22	0.161	0.916	0.359	-	2	0.055	1.10	0.026	0
SSDTF424	W10.5, S12.3	10.0	Clayey Silt / West Sidewall	8-12-98 / 06:00	<160 (<56.3)	0.145	0.112	2.6	0.345	-	-	0.024	1.20	0.029	-
SSDTF425	W10.5, S12.3	10.0	**Field Duplicate of SSDTF424**	8-12-98 / 06:15	**800-2400 (879)**	0.131	0.262	1.79	0.321	-	-7	0.027	1.20	0.029	0
SSDTF426	W10.6, S12.3	5.0	Sandy Silt / West Sidewall	8-12-98 / 06:20	<160 (71.6)	0.186	0.0791	<0.146	0.373	-	-	0.076	1.10	0.026	-
SSDTF427	W9.9, S13	10.0	Clayey Silt / South Sidewall	8-12-98 / 06:25	<160 (<56.3)	0.163	0.148	0.205	0.331	-	-	0.058	0.80	0.019	-
SSDTF428	W9.9, S13	5.0	Sandy Silt / South Sidewall	8-12-98 / 06:35	<160 (<55.0)	0.739	0.154	<0.14	0.319	-	-	0.023	0.80	0.019	-
SSDTF440	W10.1, S11.5	12.0	Trench Floor	8-13-98 / 05:56	NA	NA	NA	NA	0.353	-	-	0.023	1.60	0.037	-
SSDTF441	W10.1, S12	12.0	Trench Floor	8-13-98 / 05:57	NA	NA	NA	NA	0.361	-	-	0.044	8.30	0.149	-
SSDTF442	W10, S12.5	12.0	Trench Floor	8-13-98 / 06:00	NA	NA	NA	NA	0.331	-	-	0.023	1.50	0.035	-
SSDTF455	W8, S12.5	5.0	Silty Sand / South Sidewall	8-14-98 / 05:47	<160	0.277	0.103	4.44	0.352	-	-	0.023	1.30	0.030	-
SSDTF456	W8, S12.5	10.0	Silty Sand / South Sidewall	8-14-98 / 05:55	<160	0.147	0.164	8.22	0.336	-	-	0.025	2.10	0.046	-
SSDTF457	W7.5, S12	5.0	Silty Sand / East Sidewall	8-14-98 / 06:00	160-800	2.22	0.171	6	0.266	-	-	0.020	1.20	0.029	-
SSDTF458	W7.5, S12	10.0	Silty Sand / East Sidewall	8-14-98 / 06:10	<160	0.206	0.124	33.5	0.38	-	-	0.057	1.20	0.029	-
SSDTF460	W8, S12	11.0	Sandy Silt / Trench Floor	8-14-98 / 06:45	<160	0.246	0.127	**42**	0.428	-	-	0.026	1.30	0.030	-
SSDTF481	W8.7, S11	11.0	Clayey Silt / West Sidewall	8-18-98 / 08:25	<160 (<56.9)	0.297	0.0565	**79.5**	0.35	-	-	0.079	4.40	0.088	-
SSDTF482	W8, S11	12.0	Clayey Silt / Trench Floor	8-31-98 / 10:17	<160 (<55.6)	0.264	0.113	**833**	0.381	-	-	0.073	7.80	0.140	-
SSDTF483	W7.8, S11	5.0	Silty Sand / East Sidewall	8-31-98 / 10:19	<160 (<53.2)	1.19	0.36	**58.3**	0.307	-	-	0.039	0.60	0.014	-
SSDTF484	W7.8, S11	10.0	Clayey Silt / East Sidewall	8-31-98 / 10:21	<160 (<55.6)	0.16	0.137	**140**	0.298	-	-	0.020	2.30	0.051	-
SSDTF494	W8.1, S9.5	11.0	Clayey Silt / Trench Floor	8-31-98 / 10:23	<160 (<56.9)	0.342	0.176	**1070**	0.397	-	-	0.057	1.40	0.032	-
SSDTF505	W9, S9.5	5.0	Silty Sand / East Sidewall	8-31-98 / 10:25	<160	0.125	0.184	**263**	0.346	-	-	0.032	1.20	0.029	-
SSDTF506	W8, S9.5	10.0	East Sidewall	8-31-98 / 10:27	<160	0.177	<0.0468	**430**	0.376	-	-	0.037	3.90	0.082	-

Table 5-6. Northern and Western Excavation Area Screening Sampling Analytical Results, LEHR Southwest Trenches Area Removal Action (continued)

Sample ID	Grid Location (1)	Sample Depth (ft bgs)	Soil Type / Excavation Location	Date / Time	Total Chlordanes (μg/kg) (2)	Hg (mg/kg) (3)	Cr+6 (mg/kg) (3)	NO3 (mg/kg) (3)	Ra-226 (pCi/g) (4)	Lab Ra-226 %RPD (7)	Field Ra-226 %RPD (8)	Ra-226 Error +/-	Sr-90 (pCi/g) (5)	Sr-90 Error (+/-)	Field Sr-90 %RPD (8)
Screening Criteria (6)					**800 μg/kg**	**3.1 mg/kg (9)**	**3.8 mg/kg**	**36 mg/kg**	**0.75 pCi/g**				**10 pCi/g**		
SSDTF507	W8, S9.5	10.0	Sandy Silt with Sand / Trench Floor	8-19-98 / 08:37	<160	0.145	0.069	**401**	0.372	-	-	0.024	3.90	0.082	-
SSDTF508	W9, S9.5	5.0	Sandy Silt / North Sidewall	8-19-98 / 08:40	160-800	0.698	<0.0424	8.72	0.337	-	-	0.024	0.80	0.019	-
SSDTF509	W9, S9.5	10.0	Sandy Silt / West Sidewall	8-19-98 / 08:42	<160	0.175	0.165	**121**	0.332	-	-	0.029	1.50	0.035	-
SSDTF510	W8.5, S9.5	11.0	Silty Sand / South Sidewall	8-19-98 / 08:47	<160	0.224	0.0812	**554**	0.304	-	-	0.020	1.20	0.029	-
SSDTF511	W9, S8	5.0	North Sidewall	8-19-98 / 08:49	160-800	0.579	0.14	19.4	0.346	-	-	0.038	1.00	0.024	-
SSDTF512	W9, S8	10.0	Clayey Silt / North Sidewall	8-19-98 / 09:00	<160	0.19	0.0912	**333**	0.262	-	-	0.033	1.60	0.037	-
SSDTF513	W9.5, S8.2	5.0	Sandy Silt / West Sidewall	8-19-98 / 09:03	<160	0.473	0.112	**163**	0.306	-	-	0.023	1.10	0.026	-
SSDTF514	W9.5, S8.2	10.0	Clayey Silt / West Sidewall	8-19-98 / 09:06	<160	0.189	0.0826	**574**	0.343	-	-	0.035	3.90	0.082	-
SSDTF515	W8, S8.2	5.0	Silty Sand / East Sidewall	8-19-98 / 09:09	<160	**21.4**	0.432	**115**	0.28	-	-	0.020	0.90	0.022	-
SSDTF516	W8, S8.2	10.0	Clayey Silt / East Sidewall	8-19-98 / 09:12	<160	0.198	0.101	**300**	0.323	-	-	0.052	2.10	0.048	-
SSDTF517	W8, S8.2	10.0	**Field Duplicate of SSDTF516**	8-19-98 / 09:14	<160	0.532	0.0999	**290**	0.289	-	-11	0.034	2.10	0.048	0
SSDTF518	W8.3, S13	5.0	Trench Floor	8-21-98 / 06:11	<160	0.233	<0.0436	2.56	0.36	-	-	0.034	0.80	0.019	-
SSDTF519	W8.3, S13	5.0	Trench Floor	8-21-98 / 06:14	160-800	1.13	<0.044	2.13	0.377	-	-	0.024	0.90	0.022	-
SSDTF520	W7.7, S13	5.0	Trench Floor	8-21-98 / 06:17	160-800	0.584	0.105	0.477	0.335	-	-	0.035	1.00	0.024	-
SSDTF521	W8, S13	6.0	Trench Floor	8-21-98 / 06:19	160-800	**3.9**	0.0936	4.68	0.311	-	-	0.022	1.00	0.024	-
SSDTF522	W8, S13.3	5.0	South Sidewall	8-21-98 / 06:22	<160	<0.0181	<0.0424	0.752	0.332	-	-	0.036	0.90	0.022	-
SSDTF558	W11.2, S9.3	3.0	Sandy Silt with Sand / Trench Floor	9-1-98 / 05:56	160-800	NA	NA	NA	NA	-	-	NA	NA	NA	-
SSDTF559	W11, S8.8	2.0	Sandy Silt / North Sidewall	9-1-98 / 06:00	160-800	NA	NA	NA	NA	-	-	NA	NA	NA	-
SSDTF560	W11.4, S8.8	2.0	Sandy Silt / West Sidewall	9-1-98 / 06:06	160-800	NA	NA	NA	NA	-	-	NA	NA	NA	-
SSDTF561	W11.2, S9.3	2.0	Silty Sand / South Sidewall	9-1-98 / 06:09	160-800	NA	NA	NA	NA	-	-	NA	NA	NA	-
SSDTF575	W8, S9.5	12.0	Clayey Silt / Trench Floor	9-11-98 / 13:35	NA	NA	NA	**796**	NA	-	-	NA	NA	NA	-
SSDTF576	W8, S9.5	13.0	Clayey Silt / Trench Floor	9-11-98 / 13:40	NA	NA	NA	**481**	NA	-	-	NA	NA	NA	-
SSDTF577	W8, S9.5	14.0	Clayey Silt / Trench Floor	9-11-98 / 13:45	NA	NA	NA	**215**	NA	-	-	NA	NA	NA	-
SSDTF578	W8, S9.5	15.0	Clayey Silt / Trench Floor	9-11-98 / 13:50	NA	NA	NA	**147**	NA	-	-	NA	NA	NA	-
SSDTF579	W8, S9.5	17.0	Silty Clay / Trench Floor	9-11-98 / 13:55	NA	NA	NA	**113**	NA	-	-	NA	NA	NA	-
SSDTF580	W8, S9.5	19.0	Silty Clay / Trench Floor	9-11-98 / 14:00	NA	NA	NA	**71.8**	NA	-	-	NA	NA	NA	-
SSDTF581	W8, S11	12.0	Clayey Silt / Trench Floor	9-11-98 / 14:05	NA	NA	NA	**931**	NA	-	-	NA	NA	NA	-
SSDTF582	W8, S11	13.0	Clayey Silt / Trench Floor	9-11-98 / 14:10	NA	NA	NA	**821**	NA	-	-	NA	NA	NA	-
SSDTF583	W8, S11	12.5	**Field Duplicate of SSDTF581**	9-11-98 / 14:15	NA	NA	NA	**918**	NA	-	-	NA	NA	NA	-
SSDTF584	W8, S11	14.0	Clayey Silt / Trench Floor	9-14-98 / 10:15	NA	NA	NA	**698**	NA	-	-	NA	NA	NA	-
SSDTF585	W8, S11	15.0	Silty Clay / Trench Floor	9-14-98 / 10:20	NA	NA	NA	**341**	NA	-	-	NA	NA	NA	-
SSDTF586	W8, S11	17.0	Silty Clay / Trench Floor	9-14-98 / 10:25	NA	NA	NA	**186**	NA	-	-	NA	NA	NA	-
SSDTF587	W8, S11	19.0	Silty Clay / Trench Floor	9-14-98 / 10:30	NA	NA	NA	**108**	NA	-	-	NA	NA	NA	-
SSDTF588	W9, S9.5	12.0	Clayey Silt / Trench Floor	9-14-98 / 12:10	NA	NA	NA	**350**	NA	-	-	NA	NA	NA	-
SSDTF589	W9, S9.5	13.0	Clayey Silt / Trench Floor	9-14-98 / 12:15	NA	NA	NA	**512**	NA	-	-	NA	NA	NA	-
SSDTF590	W9, S8.5	12.0	Clayey Silt / Trench Floor	9-14-98 / 12:20	NA	NA	NA	**340**	NA	-	-	NA	NA	NA	-
SSDTF591	W9, S8.5	13.0	Clayey Silt / Trench Floor	9-14-98 / 12:25	NA	NA	NA	**265**	NA	-	-	NA	NA	NA	-

Notes:
(1) Estimated in the field.
(2) On-site field analysis performed by EPA Method 4041 (immunoassay). Data in parentheses are the verification analysis results from the off-site laboratory using EPA Method 8080.
(3) Laboratory analyses performed using EPA Method 7471, 7196 and 300.0, respectively.
(4) Analyzed by an on-site gamma spectrometer. The average Minimum Detectable Activity (MDA) for the instrument was 0.3 pCi/g.
Ra-226 activity and error were calculated by averaging the Pb-214 and Bi-214 activities measured by the gamma spectrometer.
(5) Analyzed by an on-site beta scintillation detector.
(6) Defined in the Removal Action Draft Final Work Plan, Rev D, dated July 22, 1998.
(7) Comparison of Ra-226 initial analysis and RA-226 analysis following 21-day ingrowth. Relative Percent Difference (RPD) =Difference/Mean*100
(8) Comparison of Ra-226 field duplicate analyses. RPD =Difference/Mean*100
(9) Screening criterion is RBAS recalculated in 2001 using site-specific lithology and mercury species data (see Section 6.2.2.2).

NA = not analyzed or not applicable.

** and italics indicate soil removed during subsequent excavation activities followed by resampling from the excavation sidewalls/bottom. (SSDTF294: see SSDTF558 through 561; SSDTF420: see SSDTF440 through 442.)

Boldface identifies data points exceeding the Screening Criterion.

Table 5-7. Southern Excavation Area Screening Sampling Analytical Results, LEHR Southwest Trenches Area Removal Action (continued)

Sample ID	Grid Location (1)	Sample Depth (ft bgs)	Soil Type / Excavation Location	Date / Time	Total Chlordanes (μg/kg) (2)	Hg (mg/kg) (3)	Cr+6 (mg/kg) (3)	NO3 (mg/kg) (3)	Tritium (pCi/g) (4)	Tritium Error (+/-)	Ra-226 (pCi/g) (5)	Ra-226 Error (+/-)	Sr-90 (pCi/g) (6)	Sr-90 Error (+/-)
Screening Criteria (7)					**800 μg/kg**	**3.1 mg/kg (9)**	**3.8 mg/kg**	**36 mg/kg**	**None**		**0.75 pCi/g**		**10 pCi/g**	
Southern Disposal Cell Excavations														
SSDTF524	W1, S14.3	3.0	Trench Floor	8-21-98/07:01	<160	0.501	<0.0432	0.788	NA	NA	0.270	0.020	0.70	0.024
SSDTF525	W0.5, S15	3.0	Trench Floor	8-21-98/07:04	<160	0.623	0.052	<0.142	NA	NA	0.323	0.066	0.40	0.025
SSDTF526	W0.5, S15	3.0	**Field Duplicate of SSDTF525**	8-21-98/07:07	<160	0.206	0.118	<0.138	NA	NA	0.302	0.041	0.80	0.024
SSDTF527	W1, S15	3.5	Trench Floor	8-21-98/07:10	<160	0.809	0.0989	0.752	NA	NA	0.277	0.032	1.10	0.024
SSDTF528	W1.7, S15	4.0	Trench Floor	8-21-98/10:17	<160	0.259	0.153	<0.133	0.057	0.059	0.290	0.020	0.50	0.024
SSDTF532	W4, S14.2	5.25	Silty Sand / Trench Floor	8-21-98/10:19	<160	0.107	0.0776	16.1	0.021	0.060	0.324	0.023	0.30	0.025
SSDTF533	W4, S15	5.5	Silty Sand / Trench Floor	8-21-98/10:21	160-800	0.303	0.153	1.35	0.023	0.060	0.263	0.025	0.50	0.025
SSDTF534	W6.4, S13.4	1.5	North Sidewall	8-21-98/10:23	<160	0.301	0.205	0.851	NA	NA	0.340	0.021	1.10	0.024
SSDTF535	W7.3, S14	2.0	West Sidewall	8-21-98/10:25	<160	0.511	0.147	<0.146	NA	NA	0.307	0.029	1.40	0.023
SSDTF536	W7.3, S14.4	2.0	West Sidewall	8-21-98/10:27	160-800	0.256	0.194	<0.141	NA	NA	0.335	0.058	1.20	0.024
SSDTF537	W6.8, S14	4.0	Sandy Silt with Sand / Trench Floor	8-21-98/11:23	160-800	0.206	0.0444	<0.142	0.039	0.060	0.340	0.031	0.90	0.024
SSDTF538	W6.3, S14	2.5	Sandy Silt / North Sidewall	8-21-98/11:28	160-800	0.235	0.159	<0.141	NA	NA	0.307	0.038	1.30	0.024
SSDTF543	W4.5, S14.5	5.0	Trench Floor	8-26-98/06:35	<160	0.12	0.436	<0.144	0.050	0.051	0.322	0.056	1.30	0.023
SSDTF544	W5.5, S14.5	5.0	Trench Floor	8-26-98/06:41	160-800	0.131	0.924	<0.145	0.082	0.063	0.344	0.025	1.20	0.024
SSDTF545	W5.0, S15	4.0	Trench Floor	8-26-98/06:49	<160	0.381	0.273	<0.136	-0.010	0.060	0.315	0.038	1.00	0.024
SSDTF546	W5.0, S15	4.0	**Field Duplicate of SSDTF545**	8-26-98/06:50	<160	0.273	0.216	<0.133	0.007	0.061	0.333	0.023	0.60	0.024
SSDTF547	W6.2, S14	5.0	Clayey Silt / West Sidewall	8-27-98/06:55	<160	0.531	0.177	<0.138	0.02	0.062	0.373	0.045	0.90	0.024
SSDTF548	W5.8, S13.3	3.5	Silty Sand / North Sidewall	8-27-98/06:58	<160	0.0789	<0.0432	0.324	-0.025	0.058	0.301	0.024	1.70	0.023
SSDTF549	W5.8, S13.3	3.5	**Field Duplicate of SSDTF548**	8-27-98/06:59	<160	0.103	0.208	1.03	NA	NA	0.329	0.023	1.70	0.023
SSDTF550	W4.8, S13.4	4.0	Clayey Silt / North Sidewall	8-27-98/07:02	<160	1.26	0.0618	25.4	0.04	0.061	0.283	0.030	0.90	0.024
SSDTF551	W5.2, S13.8	6.5	Clayey Silt / Trench Floor	8-27-98/07:06	<160	0.109	0.828	16.9	0.053	0.062	0.350	0.026	0.90	0.024
SSDTF552	W4.2, S13.6	4.5	Sandy Silt / North Sidewall	8-31-98/10:17	<160	0.181	0.392	1.28	-0.01	0.050	0.306	0.038	1.00	0.024
SSDTF553	W3.7, S13.6	5.5	Clayey Silt / Trench Floor	8-31-98/10:19	<160	0.138	0.732	7.82	-0.067	0.048	0.342	0.024	1.40	0.023
SSDTF554	W3.4, S13.1	3.0	Silty Sand / North Sidewall	8-31-98/10:21	<160	1.51	0.182	0.588	-0.015	0.051	0.324	0.024	0.80	0.024
SSDTF555	W3.4, S13.1	3.0	**Field Duplicate of SSDTF554**	8-31-98/10:23	<160	0.345	0.189	0.869	-0.027	0.050	0.290	0.022	0.70	0.024
SSDTF556	W3.8, S14.2	6.5	Clayey Silt / Trench Floor	8-31-98/10:25	<160	0.119	0.4	29.1	-0.039	0.049	0.386	0.040	1.20	0.024
SSDTF557	W3.1, S13.9	3.0	Clayey Silt with Sand / East Sidewall	8-31-98/10:27	<160	0.431	0.154	**38.3**	-0.031	0.049	0.316	0.082	0.90	0.024
SSDTF562	**Lab Spike**	NA	**Clayey Silt / Lab Spike**	9-2-98/09:38	NA	NA	NA	NA	NA	NA	0.349	0.050	8.80	0.170
SSDTF563	W1.0, S15.2	4.5	Silty Sand / Pit Floor	9-2-98/09:39	<160	0.165	0.135	0.759	-0.043	0.050	0.291	0.048	1.00	0.024
SSDTF564	W1.0, S14	3.5	Silty Sand / North Sidewall	9-2-98/09:41	<160	0.392	0.276	2.25	-0.067	0.049	0.324	0.024	2.70	0.022
SSDTF565	W1.0, S14	3.5	**Field Duplicate of SSDTF564**	9-2-98/09:42	<160	0.833	0.281	1.89	-0.037	0.051	0.348	0.025	2.60	0.022
SSDTF566	W2.0, S15.1	4.5	Silty Sand / Pit Floor	9-2-98/09:45	<160	0.208	0.254	0.258	-0.039	0.049	0.294	0.021	0.60	0.024
SSDTF567	W2.0, S14.4	4.0	Sandy Silt / Pit Floor	9-2-98/09:49	160-800	0.458	0.139	3.96	-0.053	0.048	0.327	0.076	1.30	0.024
SSDTF568	W3.0, S15	5.0	Silty Sand / Pit Floor	9-2-98/09:52	160-800	0.156	0.17	0.439	-0.052	0.050	0.291	0.058	0.70	0.024
SSDTF569	W3.0, S14.3	5.0	Silty Sand / Pit Floor	9-2-98/09:54	<160	0.597	0.227	12.6	-0.046	0.049	0.351	0.031	0.90	0.024
SSDTF571	W0.2, S15.1	4.0	Silty Sand / South Sidewall	9-4-98/12:37	NA	1.12	0.13	1.1	-0.051	0.062	0.310	0.031	1.50	0.023
SSDTF572	W0.18, S14.4	4.0	Silty Sand with Gravel / North Sidewall	9-4-98/12:38	NA	0.889	0.139	2.21	-0.074	0.058	0.304	0.035	0.60	0.024
SSDTF573	W0.2, S14.7	5.0	Silty Sand with Gravel / Trench Floor	9-4-98/12:41	NA	0.397	0.135	0.931	-0.050	0.058	0.294	0.053	0.70	0.024
SSDTF574	W0.4, S14.7	4.0	Silty Sand / East Sidewall	9-4-98/12:43	NA	0.243	0.361	0.105	-0.048	0.058	0.254	0.044	0.80	0.024

Notes:
(1) Estimated in the field.
(2) On-site field analysis performed by EPA Method 4041 (immunoassay).
(3) Laboratory analyses for mercury, hexavalent chromium and nitrate performed using EPA Method 7471, 7196 and 300.0, respectively.
(4) Tritium samples were analyzed by ThermoNUTech laboratory. All results are below their respective Minimum Detectable Activity (MDA).
(5) Analyzed by an on-site gamma spectrometer. The average Minimum Detectable Activity (MDA) for the instrument was 0.3 pCi/g.
Ra-226 activity and error were calculated by averaging the Pb-214 and Bi-214 activities measured by the gamma spectrometer.
(6) Analyzed by an on-site beta scintillation detector.
(7) Defined in the Removal Action Draft Final Work Plan, Rev D, dated July 22, 1998.
(8) Comparison of Ra-226 field duplicate analyses. Relative Percent Difference (RPD) =Difference/Mean*100
(9) Screening criterion is RBAS recalculated in 2001 using site-specific lithology and mercury species data (see Section 6.2.2.2).
- NA = not analyzed or not applicable.
- **Boldface** identifies data points exceeding the Screening Criterion.

Table 5-8. Waste Excavation Confirmation Sampling Summary, LEHR Southwest Trenches Area Removal Action

Constituent	Units	Number of Samples > Detection Limit [1]	Number of Detections > Background	Background Concentration	Maximum Detected Concentration	Maximum Sample ID	Sample Depth (ft)
Metals							
Antimony	mg/kg	19	1	1.40	1.5	SSDTC069	4
Barium	mg/kg	63	1	260.00	286	SSDTC087	10
Chromium	mg/kg	63	7	181.00	314	SSDTC025	3
Chromium, Hexavalent	mg/kg	42	42	0.05	1.06	SSDTC052	4
Copper	mg/kg	63	0	60.00	51.5	SSDTC067	8
Lead	mg/kg	63	1	9.50	10.3	SSDTC029	3
Manganese	mg/kg	63	6	750.00	968	SSDTC080	12
Mercury	mg/kg	63	23	0.63	6.1	SSDTC069	4
Selenium	mg/kg	19	3	1.20	1.6	SSDTC089	12
Silver	mg/kg	9	2	0.55	0.75	SSDTC052	4
Zinc	mg/kg	63	1	87.00	150	SSDTC020	3
Pesticides/PCBs							
4,4'-DDD	µg/kg	6	6	0.00	11.50	SSDTC044	12
4,4'-DDE	µg/kg	28	28	0.00	26.80	SSDTC062	4
4,4'-DDT	µg/kg	6	6	0.00	276.00	SSDTC041DL1	6
alpha-Chlordane	µg/kg	44	44	0.00	110.00	SSDTC058DL1	4
delta-BHC	µg/kg	1	1	0.00	0.12	SSDTC072	5
Dieldrin	µg/kg	1	1	0.00	0.63	SSDTC072	5
Endosulfan Sulfate	µg/kg	1	1	0.00	0.09	SSDTC072	5
gamma-Chlordane	µg/kg	44	44	0.00	94.80	SSDTC058DL1	4
Heptachlor	µg/kg	12	12	0.00	16.70	SSDTC045	12
PCB-1260 (Arochlor)	µg/kg	1	1	0.00	9.70	SSDTC046	12
Radionuclides							
Americium-241	pCi/g	5	3	0.01	1.61	SSDTC090&R	11
Bismuth-212	pCi/g	61	24	0.43	0.76	SSDTC036	6
Bismuth-214	pCi/g	57	16	0.54	0.64	SSDTC047	12
Carbon-14	pCi/g	26	24	0.13	5.84	SSDTC024	3
Cesium-137	pCi/g	8	8	0.01	1.18	SSDTC036	6
Cobalt-60	pCi/g	0	0	0.01	n/a		
Lead-210	pCi/g	7	2	1.60	4.43	SSDTC078	12
Lead-214	pCi/g	63	37	0.58	0.77	SSDTC088	12
Plutonium-241	pCi/g	7	1	0.50	0.52	SSDTC020	3

Table 5-8. Waste Excavation Confirmation Sampling Summary, LEHR Southwest Trenches Area Removal Action (continued)

Constituent	Units	Number of Samples > Detection Limit (1)	Number of Detections > Background	Background Concentration	Maximum Detected Concentration	Maximum Sample ID	Sample Depth (ft)
Radium-223	pCi/g	0	0	n/a	n/a		
Radium-226	pCi/g	63	1	0.75	0.76	SSDTC046	12
Strontium-90	pCi/g	24	21	0.06	7.91	SSDTC020	3
Thorium-228	pCi/g	63	5	0.74	0.89	SSDTC076	5
Thorium-232	pCi/g	64	0	0.75	0.73	SSDTC087	10
Thorium-234	pCi/g	29	19	0.78	3.74	SSDTC043	13
Tritium	pCi/g	12	11	1.20	5.20	SSDTC086	4
Uranium-235	pCi/g	50	3	0.04	0.06	SSDTC079	8
VOCs							
2-Butanone	µg/kg	9	9	0.00	548.00	SSDTC049	4
Acetone	µg/kg	1	1	0.00	14.90	SSDTC081R	12
EthylBenzene	µg/kg	13	13	0.00	2.87	SSDTC048	6
Styrene	µg/kg	1	1	0.00	1.03	SSDTC090	11
Toluene	µg/kg	40	40	0.00	438.00	SSDTC056	5
Xylenes (Total)	µg/kg	23	23	0.00	16.40	SSDTC075R	3

Notes

(1) For radionuclides, this value identifies the number of samples that exceeded the minimum detectable activity.

Abbreviations

mg/kg milligrams per kilogram
pCi/g picoCuries per gram
µg/kg micrograms per kilogram

Table 5-9. Cobble and Gravel Area Sampling Off-Site Laboratory Analytical Results, LEHR Southwest Trenches Area Removal Action

Sample ID	Grid Location (1)	Sample Depth (bgs)	Sample Matrix	Lithology	Date / Time	Total Chlordanes (ug/kg) (2)	Hg (mg/kg) (2)	Cr^{+6} (mg/kg) (2)	NO_3 (mg/kg) (2)	Ra-226 (pCi/g) (2)	Ra-226 Error (+/-)	Sr-90 (pCi/g) (2)	Sr-90 Error (+/-)
Screening Criteria (3)						**800 ug/kg**	**3.1 mg/kg (4)**	**3.8 mg/kg**	**36 mg/kg**	**0.75 pCi/g**	**-**	**10 pCi/g**	**-**
SSDTF223	W4.2, S8.2	4.5	Clayey Silt	Sandy Silt at 0.0', Cobbles at 1.5', Clayey Silt at 4.0'	7-17-98 / 14:05	< 103	0.19	0.246	<0 .160	0.528	0.0742	-0.00065	0.0341
SSDTF225	W4.2, S7.2	4.5	Silty Sand	Clayey Silt at 0.0', Cobbles at 1.5', Silty Sand at 4.0'	7-20-98 / 07:05	< 89.6	0.19	0.0742	< 0.135	0.379	0.0603	-0.0238	0.0292
SSDTF230	W4.2, S6.2	4.5	Silty Sand	Clayey Silt at 0.0', Cobbles at 1.5', Silty Sand at 4.0'	7-20-98 / 07:43	161	1.2	0.0972	< 0.137	0.453	0.0748	-0.0414	0.0251
SSDTF234	W4.2, S5.2	4.5	Silty Sand	Clayey Silt at 0.0', Cobbles at 1.5', Silty Sand at 4.0'	7-20-98 / 10:07	< 92.6	0.75	0.174	< 0.144	0.409	0.0631	-0.0426	0.0284
SSDTF238	W4.2, S4.2	2.0	Silty Sand	Gravelly Silt at 0.0', Silty Sand at 1.5'	7-20-98 / 12:54	< 95.8	0.84	0.104	0.220	0.480	0.0684	-0.0298	0.0322
SSDTF239	W4.2, S3.2	2.0	Silty Sand	Gravelly Silt at 0.0', Silty Sand at 1.5'	7-20-98 / 15:35	205	0.43	0.150	2.80	0.527	0.0797	-0.00357	0.0310
SSDTF241	W3.2, S5.2	2.0	Silty Sand	Gravelly Silt at 0.0', Silty Sand at 1.5'	7-21-98 / 06:42	< 93.6	0.33	0.0981	1.60	0.478	0.0694	0.00781	0.0293
SSDTF242	W2.2, S5.2	4.0	Silty Sand	Gravelly Silt at 0.0', Cobbles at 1.5', Silty Sand at 3.5'	7-21-98 / 07:30	259	0.45	0.154	1.92	0.473	0.0628	-0.0166	0.0346
SSDTF244	W1.4, S6.2	4.0	Silty Sand	Gravel at 0.0', Cobbles at 1.5', Silty Sand at 3.5'	7-21-98 / 09:53	< 89.6	0.97	< 0.0428	< 0.137	0.353	0.0577	0.0111	0.0388
SSDTF245	W2.2, S6.2	2.0	Silty Sand	Gravelly Silt at 0.0', Silty Sand at 1.5'	7-21-98 / 10:26	< 93.6	0.63	0.0872	0.722	0.528	0.0993	-0.0186	0.0235
SSDTF248	W6.2, S3.2	2.0	Silty Sand	Gravelly Silt at 0.0', Silty Sand at 1.5'	7-21-98 / 13:10	< 91.6	1.4	0.174	0.418	0.411	0.0637	-0.00485	0.0305
SSDTF251	W7.2, S11.2	2.0	Silty Sand	Gravelly Silt at 0.0', Silty Sand at 1.5'	7-21-98 / 14:50	212	3.2	0.122	1.19	0.499	0.0720	-0.0220	0.0256
SSDTF252	W1.4, S8.8	3.5	Silty Sand	Gravelly Silt at 0.0', Cobbles at 1.5', Silty Sand at 3.0'	7-22-98 / 06:35	< 90.6	0.83	0.140	< 0.138	0.427	0.0695	-0.0150	0.0248
SSDTF258	W1.4, S7.2	3.0	Silty Sand	Gravelly Silt and Cobbles at 0.0', Silty Sand at 2.5'	7-22-98 / 10:00	210	1.1	0.151	0.981	0.434	0.0669	0.00552	0.0425
SSDTF259	W4.2, S10.2	3.0	Silty Sand	Gravelly Silt at 0.0', Silty Sand at 2.5'	7-22-98 / 13:25	< 94.7	0.21	0.181	0.644	0.374	0.0605	-0.0475	0.0550
SSDTF263	W4.2, S12.2	3.5	Silty Sand	Silty Gravel at 0.0', Sandy Silt at 3.0'	7-23-98 / 07:45	< 98.0	1.4	0.336	2.20	0.609	0.120	-0.0316	0.0217
SSDTF268	W7.8, S5.2	3.0	Silty Sand	Gravelly Silt at 0.0', Silty Sand at 2.5'	7-23-98 / 10:40	< 94.7	0.70	0.148	3.06	0.491	0.0724	-0.119	0.0781
SSDTF269	W6.2, S5.2	3.0	Silty Sand	Gravelly Silt at 0.0', Silty Sand at 2.5'	7-23-98 / 14:15	218	0.69	0.151	1.74	0.530	0.105	0.0123	0.0470
SSDTF360	W4.0, S6.5	2.0-3.0	Cobble	Clayey Silt at 0.0', Cobble at 1.5'	8-6-98 / 12:20	< 83.6	0.75	0.0799	5.72	0.352	0.0584	-0.00019	0.0700
SSDTF361	W4.0, S7.5	2.0-3.0	Cobble	Clayey Silt at 0.0', Cobble at 1.5'	8-6-98 / 12:25	< 82.0	1.0	0.0474	1.18	0.287	0.0469	0.00616	0.0422
SSDTF362	W4.0, S8.5	2.0-3.0	Cobble	Clayey Silt at 0.0', Cobble at 1.5'	8-6-98 / 12:28	73.8	0.59	0.0808	4.94	0.257	0.0479	0.00772	0.0367
SSDTF363	W4.0, S11.0	2.0-3.0	Cobble	Clayey Silt at 0.0', Mixed Cobble, Gravel and Fines at 1.5'	8-6-98 / 12:28	< 86.8	0.40	0.0988	2.49	0.471	0.0689	-0.0136	0.0489
SSDTF364	W4.0, S9.5	2.0-3.0	Cobble	Clayey Silt at 0.0', Cobble at 1.5'	8-6-98 / 12:28	108	0.07	<0.0393	1.34	0.126	0.0694	0.00614	0.0286
SSDTF365	W4.0, S12.0	2.0-3.0	Cobble	Clayey Silt at 0.0', Mixed Cobble, Gravel and Fines at 1.5'	8-6-98 / 13:01	< 84.2	0.09	0.148	2.41	0.440	0.0818	0.0359	0.0713
SSDTF366	W1.5, S9.5	2.0-3.0	Cobble	Gravelly Silt at 0.0', Cobble at 1.5'	8-6-98 / 13:20	206	0.59	0.120	0.898	0.336	0.0566	-0.0102	0.0784
SSDTF367	W1.5, S9.5	2.0-3.0	**Field Dup. of 366**	Gravelly Silt at 0.0', Cobble at 1.5'	8-6-98 / 13:22	**3590**	0.05	0.129	<0.128	0.275	0.0535	-0.105	0.0582
SSDTF368	W1.5, S8.5	2.0-3.0	Cobble	Silty Gravel at 0.0', Cobble at 1.5'	8-6-98 / 13:33	< 83.1	0.07	0.118	0.938	0.357	0.0533	-0.0379	0.0688
SSDTF369	W1.5, S6.5	2.0-3.0	Cobble	Silty Gravel at 0.0', Cobble at 1.5'	8-6-98 / 13:28	93.2	1.7	0.216	0.638	0.317	0.0495	0.0450	0.0716
SSDTF370	W2.0, S5.5	2.0-3.0	Cobble	Clayey Silt at 0.0', Mixed Cobble, Gravel and Fines at 1.5'	8-6-98 / 13:31	< 84.8	0.43	0.269	1.82	0.242	0.0460	0.00704	0.0392

Notes:
(1) Grid locations are estimated from field measurements.
(2) Chlordane, Mercury, Hexavalent Chromium, Nitrate, Radium-226 and Strontium-90 results are off-site laboratory analyses performed using EPA Methods 8080, 7471, 7196, 300.0, 901.1 and 905.0, respectively.
(3) Defined in the Removal Action Draft Final Work Plan, Rev D, dated July 22, 1998.
(4) Screening criterion is RBAS recalculated in 2001 using site-specific lithology and mercury species data (see Section 6.2.2.2).
- NA = not analyzed or not applicable.
- **Boldface** identifies data points exceeding the Screening Criterion.

Table 5-10. Cobble/Gravel Area Sampling On-Site Laboratory Analytical Results, LEHR Southwest Trenches Area Removal Action

Sample ID Screening Criteria (3)	Ra-226 (pCi/g) (1) 0.75 pCi/g	Ra-226 Error (+/-)	Sr-90 (pCi/g) (2) 10 pCi/g	Sr-90 Error (+/-)
SSDTF223	0.386	0.034	1.10	0.0264
SSDTF225	0.288	0.063	1.30	0.0299
SSDTF230	0.290	0.020	1.00	0.0240
SSDTF234	0.334	0.072	1.10	0.0264
SSDTF238	0.291	0.041	0.60	0.0144
SSDTF239	0.278	0.020	0.70	0.0168
SSDTF241	0.323	0.071	0.70	0.0168
SSDTF242	0.307	0.023	0.60	0.0144
SSDTF244	0.327	0.045	0.40	0.010
SSDTF245	0.387	0.024	0.80	0.0192
SSDTF248	0.401	0.026	1.00	0.0240
SSDTF251	0.352	0.023	0.60	0.0144
SSDTF252	0.272	0.023	0.80	0.0192
SSDTF258	0.271	0.067	0.70	0.0168
SSDTF259	0.398	0.023	0.80	0.0192
SSDTF263	0.309	0.023	1.10	0.0264
SSDTF268	0.318	0.020	0.70	0.0168
SSDTF269	0.404	0.033	0.60	0.0144

Notes:
(1) Analyzed by an on-site gamma spectrometer. The average Minimum Detectable Activity (MDA) for the instrument was measured at 0.3 pCi/g. Ra-226 activity and error were calculated by averaging the Pb-214 and Bi-214 activities measured by the gamma spectrometer.
(2) Analyzed by an on-site beta scintillation detector.
(3) Defined in the Removal Action Draft Final Work Plan, Rev. D, dated July 22, 1998.
- NA = not analyzed or not applicable.
- **Bold-face** identifies data points exceeding the Screening Criterion.

Table 5-11. Nitrate Delineation Results, LEHR Southwest Trenches Area Removal Action

Nitrate Soil Boring	Sample ID	Depth (ft bgs)	Date	Soil Matrix	Notes	Nitrate Conc. (mg/kg)
NSB-01	SSDTF592	3.0	12/7/1998	Sandy Silt		0.832
NSB-01	SSDTF593	6.0	12/7/1998	Sandy Silt		<1.0
NSB-01	SSDTF594	9.0	12/7/1998	Clayey Silt		5.84
NSB-01	SSDTF595	12.0	12/7/1998	Clayey Silt		6.22
NSB-01	SSDTF596	15.0	12/7/1998	Clayey Silt		18.8
NSB-01	SSDTF597	18.0	12/7/1998	Silty Clay		16.6
NSB-01	SSDTF598	21.0	12/7/1998	Silty Clay		8.73
NSB-01	SSDTF599	24.0	12/7/1998	Silty Clay		8.37
NSB-01	SSDTF600	27.0	12/7/1998	Silty Clay		11.8
NSB-01	SSDTF601	29.0	12/7/1998	Silty Clay	Refusal - TD @ 29.5 ft.	10.9
NSB-02	SSDTF602	3.0	12/8/1998	Sandy Silt		7.25
NSB-02	SSDTF603	6.0	12/8/1998	Sandy Silt		6.47
NSB-02	SSDTF604	9.0	12/8/1998	Clayey Silt		7.68
NSB-02	SSDTF605	12.0	12/8/1998	Clayey Silt		12.6
NSB-02	SSDTF606	15.0	12/8/1998	Clayey Silt		19.2
NSB-02	SSDTF607	18.0	12/8/1998	Silty Clay		19.3
NSB-02	SSDTF608	21.0	12/8/1998	Silty Clay		19.6
NSB-02	SSDTF609	24.0	12/8/1998	Silty Clay		9.64
NSB-02	SSDTF610	24.5	12/8/1998	Silty Clay	**Field Duplicate (SSDTF609)**	8.04
NSB-02	SSDTF611	27.0	12/8/1998	Silty Clay		10.8
NSB-02	SSDTF612	30.0	12/8/1998	Silty Clay	TD @ 30.5 ft	8.84
NSB-03	SSDTF613	3.0	12/8/1998	Sandy Silt		6.6
NSB-03	SSDTF614	6.0	12/8/1998	Sandy Silt		3.63
NSB-03	SSDTF615	9.0	12/8/1998	Clayey Silt		14.7
NSB-03	SSDTF616	12.0	12/8/1998	Clayey Silt		6.4
NSB-03	SSDTF617	15.0	12/8/1998	Clayey Silt		14.6
NSB-03	SSDTF618	18.0	12/8/1998	Clayey Silt		28.5
NSB-03	SSDTF619	18.5	12/8/1998	Clayey Silt	**Field Duplicate (SSDTF618)**	24.2
NSB-03	SSDTF620	21.0	12/8/1998	Sandy Silt		17.9
NSB-03	SSDTF621	24.0	12/8/1998	Clayey Silt		6.58
NSB-03	SSDTF622	27.0	12/8/1998	Silty Clay		10.4
NSB-03	SSDTF623	30.0	12/8/1998	Silty Clay	TD @ 30.5 ft	19.9
NSB-04	SSDTF624	3.0	12/8/1998	Sandy Silt		8.21
NSB-04	SSDTF625	6.0	12/8/1998	Sandy Silt		13
NSB-04	SSDTF626	9.0	12/8/1998	Clayey Silt		**87.8**
NSB-04	SSDTF627	9.5	12/8/1998	Clayey Silt	**Field Duplicate (SSDTF626)**	**74.1**
NSB-04	SSDTF628	12.0	12/8/1998	Clayey Silt		**52.7**
NSB-04	SSDTF629	15.0	12/8/1998	Clayey Silt		**36.5**
NSB-04	SSDTF630	18.0	12/8/1998	Clayey Silt		18.3
NSB-04	SSDTF631	21.0	12/8/1998	Silty Clay		16.4
NSB-04	SSDTF632	24.0	12/8/1998	Silty Clay		8.72
NSB-04	SSDTF633	27.0	12/8/1998	Silty Clay		17.5
NSB-04	SSDTF634	30.0	12/8/1998	Silty Clay	TD @ 30.5 ft	12.7
NSB-05	SSDTF635	3.0	12/8/1998	Sandy Silt		10.1
NSB-05	SSDTF636	6.0	12/8/1998	Sandy Silt		4.43
NSB-05	SSDTF637	9.0	12/8/1998	Clayey Silt		32.2
NSB-05	SSDTF638	12.0	12/8/1998	Clayey Silt		**45.5**
NSB-05	SSDTF639	12.5	12/8/1998	Clayey Silt	**Field Duplicate (SSDTF638)**	**50.6**
NSB-05	SSDTF640	15.0	12/8/1998	Clayey Silt		**89.1**
NSB-05	SSDTF641	18.0	12/8/1998	Silty Clay		**36.2**
NSB-05	SSDTF642	21.0	12/8/1998	Silty Clay		32
NSB-05	SSDTF643	24.0	12/8/1998	Silty Clay		8.27
NSB-05	SSDTF644	27.0	12/8/1998	Silty Clay		1.1
NSB-05	SSDTF645	30.0	12/8/1998	Silty Clay	TD @ 30.5 ft	22.2

Table 5-11. Nitrate Delineation Results, LEHR Southwest Trenches Area Removal Action (continued)

Nitrate Soil Boring	Sample ID	Depth (ft bgs)	Date	Soil Matrix	Notes	Nitrate Conc. (mg/kg)
NSB-06	SSDTF646	3.0	12/8/1998	Sandy Silt		7.23
NSB-06	SSDTF647	6.0	12/8/1998	Sandy Silt		0.763
NSB-06	SSDTF648	9.0	12/8/1998	Clayey Silt		**94.1**
NSB-06	SSDTF649	12.0	12/8/1998	Clayey Silt		**118**
NSB-06	SSDTF650	15.0	12/8/1998	Clayey Silt		**145**
NSB-06	SSDTF651	15.5	12/8/1998	Clayey Silt	**Field Duplicate (SSDTF650)**	**128**
NSB-06	SSDTF652	18.0	12/8/1998	Silty Clay		**73.5**
NSB-06	SSDTF653	21.0	12/8/1998	Silty Clay	Refusal - TD @ 22.0 ft.	27.1
NSB-07	SSDTF654	3.0	12/9/1998	Silty Sand		5.68
NSB-07	SSDTF655	6.0	12/9/1998	Sandy Silt		**94.3**
NSB-07	SSDTF656	9.0	12/9/1998	Clayey Silt		**62**
NSB-07	SSDTF657	12.0	12/9/1998	Clayey Silt		**84.6**
NSB-07	SSDTF658	15.0	12/9/1998	Clayey Silt		**63.4**
NSB-07	SSDTF659	18.0	12/9/1998	Silty Clay		**73**
NSB-07	SSDTF660	18.5	12/9/1998	Silty Clay	**Field Dupllicate (SSDTF659)**	**70.9**
NSB-07	SSDTF661	21.0	12/9/1998	Silty Clay	Refusal - TD @ 22.0 ft.	26.4
NSB-08	SSDTF662	3.0	12/9/1998	Sandy Silt		7.91
NSB-08	SSDTF663	6.0	12/9/1998	Clayey Silt		**43.3**
NSB-08	SSDTF664	9.0	12/9/1998	Clayey Silt		**42**
NSB-08	SSDTF665	12.0	12/9/1998	Clayey Silt		**64**
NSB-08	SSDTF666	12.5	12/9/1998	Clayey Silt	**Field Duplicate (SSDTF665)**	**62.7**
NSB-08	SSDTF667	15.0	12/9/1998	Clayey Silt		**77.6**
NSB-08	SSDTF668	18.0	12/9/1998	Silty Clay		**57.2**
NSB-08	SSDTF669	21.0	12/9/1998	Silty Clay		20.8
NSB-08	SSDTF670	24.0	12/9/1998	Silty Clay		15.5
NSB-08	SSDTF671	27.0	12/9/1998	Silty Clay		28.1
NSB-08	SSDTF672	29.0	12/9/1998	Silty Clay	Refusal - TD @ 29.5 ft.	33.3
NSB-09	SSDTF673	6.0	12/9/1998	Sandy Silt		5.74
NSB-09	SSDTF674	9.0	12/9/1998	Clayey Silt		8.68
NSB-09	SSDTF675	12.0	12/9/1998	Clayey Silt		0.354
NSB-09	SSDTF676	15.0	12/9/1998	Clayey Silt		8.7
NSB-09	SSDTF677	18.0	12/9/1998	Silty Clay		24.7
NSB-09	SSDTF678	21.0	12/9/1998	Silty Clay		1.69
NSB-09	SSDTF679	21.5	12/9/1998	Silty Clay	**Field Duplicate (SSDTF678)**	1.41
NSB-09	SSDTF680	24.0	12/9/1998	Silty Clay		3.52
NSB-09	SSDTF681	27.0	12/9/1998	Silty Clay	Refusal - TD @ 28.0 ft.	4.19
NSB-10	SSDTF682	12.0	12/9/1998	Clayey Silt		**50**
NSB-10	SSDTF683	15.0	12/9/1998	Clayey Silt		**115**
NSB-10	SSDTF684	18.0	12/9/1998	Silty Clay		**68.9**
NSB-10	SSDTF685	21.0	12/9/1998	Silty Clay		28.8
NSB-10	SSDTF686	24.0	12/9/1998	Silty Clay		**47.3**
NSB-10	SSDTF687	24.5	12/9/1998	Silty Clay	**Field Duplicate (SSDTF686)**	35.9
NSB-10	SSDTF688	27.0	12/9/1998	Silty Clay		**64.4**
NSB-10	SSDTF689	30.0	12/9/1998	Silty Clay	TD @ 30.5 ft	**49.6**
NSB-11	SSDTF690	12.0	12/10/1998	Clayey Silt		**65.7**
NSB-11	SSDTF691	15.0	12/10/1998	Clayey Silt		**294**
NSB-11	SSDTF692	18.0	12/10/1998	Clayey Silt		**97.4**
NSB-11	SSDTF693	21.0	12/10/1998	Silty Clay		**72.3**
NSB-11	SSDTF694	21.5	12/10/1998	Silty Clay	**Field Duplicate (SSDTF693)**	**68.3**
NSB-11	SSDTF695	24.0	12/10/1998	Silty Clay		**61.5**
NSB-11	SSDTF696	26.0	12/10/1998	Silty Clay	Refusal - TD @ 26.5 ft.	**73.8**

Table 5-11. Nitrate Delineation Results, LEHR Southwest Trenches Area Removal Action (continued)

Nitrate Soil Boring	Sample ID	Depth (ft bgs)	Date	Soil Matrix	Notes	Nitrate Conc. (mg/kg)
NSB-12	SSDTF697	12.0	12/10/1998	Clayey Silt		**250**
NSB-12	SSDTF698	15.0	12/10/1998	Clayey Silt		**195**
NSB-12	SSDTF699	18.0	12/10/1998	Clayey Silt		**102**
NSB-12	SSDTF700	21.0	12/10/1998	Silty Clay		**45.9**
NSB-12	SSDTF701	24.0	12/10/1998	Silty Clay		26.5
NSB-12	SSDTF702	27.0	12/10/1998	Silty Clay		**38.4**
NSB-12	SSDTF703	27.5	12/10/1998	Silty Clay	**Field Duplicate (SSDTF702)**	**38.7**
NSB-12	SSDTF704	30.0	12/10/1998	Silty Clay	TD @ 30.5 ft	35.7
NSB-13	SSDTF705	12.0	12/10/1998	Clayey Silt		**351**
NSB-13	SSDTF706	15.0	12/10/1998	Clayey Silt		**133**
NSB-13	SSDTF707	18.0	12/10/1998	Clayey Silt		**65.7**
NSB-13	SSDTF708	21.0	12/10/1998	Clayey Silt		**53.2**
NSB-13	SSDTF709	24.0	12/10/1998	Silty Sand		**37**
NSB-13	SSDTF710	24.5	12/10/1998	Silty Sand	**Field Duplicate (SSDTF709)**	17.8
NSB-13	SSDTF711	27.0	12/10/1998	Silty Clay		**40.2**
NSB-13	SSDTF712	30.0	12/10/1998	Silty Clay	TD @ 30.5 ft	**49.6**
NSB-14	SSDTF713	12.0	12/10/1998	Clayey Silt	Geotextile Liner @ 10.5 ft.	**50.2**
NSB-14	SSDTF714	15.0	12/10/1998	Clayey Silt		17.2
NSB-14	SSDTF715	18.0	12/10/1998	Sandy Silt		10.4
NSB-14	SSDTF716	21.0	12/10/1998	Silty Sand		8.48
NSB-14	SSDTF717	21.5	12/10/1998	Silty Sand	**Field Duplicate (SSDTF716)**	7.54
NSB-14	SSDTF718	24.0	12/10/1998	Silty Clay		5.93
NSB-14	SSDTF719	27.0	12/10/1998	Silty Clay		7.7
NSB-14	SSDTF720	30.0	12/10/1998	Silty Clay	TD @ 30.5 ft	6.86
NSB-15	SSDTF721	12.0	12/10/1998	Clayey Silt	Geotextile Liner @ 10.0 ft.	1.27
NSB-15	SSDTF722	15.0	12/10/1998	Clayey Silt		11.4
NSB-15	SSDTF723	18.0	12/10/1998	Clayey Silt		11.2
NSB-15	SSDTF724	21.0	12/10/1998	Silty Clay		20.6
NSB-15	SSDTF725	24.0	12/10/1998	Silty Clay		6.82
NSB-15	SSDTF726	27.0	12/10/1998	Silty Clay		9.46
NSB-15	SSDTF727	30.0	12/10/1998	Silty Clay	TD @ 30.5 ft	14.1
NSB-16	SSDTF728	12.0	12/11/1998	Clayey Silt	Geotextile Liner @ 10.5 ft.	3.77
NSB-16	SSDTF729	15.0	12/11/1998	Clayey Silt		4.76
NSB-16	SSDTF730	18.0	12/11/1998	Clayey Silt		3.85
NSB-16	SSDTF731	21.0	12/11/1998	Silty Clay		2.25
NSB-16	SSDTF732	24.0	12/11/1998	Silty Clay		4.04
NSB-16	SSDTF733	27.0	12/11/1998	Silty Clay		6.21
NSB-16	SSDTF734	30.0	12/11/1998	Silty Clay	TD @ 30.5 ft	6.51
NSB-17	SSDTF735	3.0	12/11/1998	Sandy Silt		8.99
NSB-17	SSDTF736	6.0	12/11/1998	Sandy Silt		0.805
NSB-17	SSDTF737	9.0	12/11/1998	Clayey Silt		0.733
NSB-17	SSDTF738	12.0	12/11/1998	Clayey Silt		0.885
NSB-17	SSDTF739	15.0	12/11/1998	Clayey Silt		15.6
NSB-17	SSDTF740	18.0	12/11/1998	Clayey Silt		10.2
NSB-17	SSDTF741	21.0	12/11/1998	Silty Clay		6.83
NSB-17	SSDTF742	24.0	12/11/1998	Silty Clay		9.36
NSB-17	SSDTF743	27.0	12/11/1998	Silty Clay	Refusal - TD @ 28.0 ft.	17.3
NSB-17	SSDTF744	27.5	12/11/1998	Silty Clay	**Field Duplicate (SSDTF743)**	16.6

Table 5-11. Nitrate Delineation Results, LEHR Southwest Trenches Area Removal Action (continued)

Nitrate Soil Boring	Sample ID	Depth (ft bgs)	Date	Soil Matrix	Notes	Nitrate Conc. (mg/kg)
NSB-18	SSDTF745	3.0	12/11/1998	Sandy Silt		2.32
NSB-18	SSDTF746	6.0	12/11/1998	Sandy Silt		1.34
NSB-18	SSDTF747	9.0	12/11/1998	Clayey Silt		18.9
NSB-18	SSDTF748	12.0	12/11/1998	Clayey Silt		**75**
NSB-18	SSDTF749	12.5	12/11/1998	Clayey Silt	**Field Duplicate (SSDTF748)**	**53.4**
NSB-18	SSDTF750	15.0	12/11/1998	Clayey Silt		16.4
NSB-18	SSDTF751	18.0	12/11/1998	Silty Clay		10.6
NSB-18	SSDTF752	21.0	12/11/1998	Silty Clay		10.9
NSB-18	SSDTF753	24.0	12/11/1998	Silty Clay		10.9
NSB-18	SSDTF754	26.0	12/11/1998	Silty Clay	Refusal - TD @ 26.5 ft.	13
NSB-19	SSDTF755	3.0	12/11/1998	Sandy Silt		<1.0
NSB-19	SSDTF756	6.0	12/11/1998	Sandy Silt		2.45
NSB-19	SSDTF757	9.0	12/11/1998	Clayey Silt		18.5
NSB-19	SSDTF758	12.0	12/11/1998	Clayey Silt		27.9
NSB-19	SSDTF759	12.5	12/11/1998	Clayey Silt	**Field Duplicate (SSDTF758)**	6.98
NSB-19	SSDTF760	15.0	12/11/1998	Clayey Silt		5.81
NSB-19	SSDTF761	18.0	12/11/1998	Clayey Silt		6.82
NSB-19	SSDTF762	21.0	12/11/1998	Silty Clay		7.83
NSB-19	SSDTF763	24.0	12/11/1998	Silty Clay		10.5
NSB-19	SSDTF764	27.0	12/11/1998	Silty Clay	Refusal - TD @ 27.5 ft.	13.1
NSB-20	SSDTF765	3.0	12/14/1998	Sandy Silt		6.69
NSB-20	SSDTF766	6.0	12/14/1998	Sandy Silt		5.5
NSB-20	SSDTF767	9.0	12/14/1998	Clayey Silt		6.34
NSB-20	SSDTF768	12.0	12/14/1998	Clayey Silt		10.2
NSB-20	SSDTF769	15.0	12/14/1998	Clayey Silt		13.1
NSB-20	SSDTF770	15.5	12/14/1998	Clayey Silt	**Field Duplicate (SSDTF769)**	20.4
NSB-20	SSDTF771	18.0	12/14/1998	Clayey Silt		11
NSB-20	SSDTF772	21.0	12/14/1998	Silty Clay		13.9
NSB-20	SSDTF773	24.0	12/14/1998	Silty Clay	Refusal - TD @ 25.0 ft.	16
NSB-21	SSDTF774	9.0	12/14/1998	Clayey Silt		0.392
NSB-21	SSDTF775	12.0	12/14/1998	Clayey Silt	Geotextile Liner @ 10.0 ft.	0.341
NSB-21	SSDTF776	15.0	12/14/1998	Clayey Silt		5.94
NSB-21	SSDTF777	15.5	12/14/1998	Clayey Silt	**Field Duplicate (SSDTF776)**	3.07
NSB-21	SSDTF778	18.0	12/14/1998	Clayey Silt		9.49
NSB-21	SSDTF779	21.0	12/14/1998	Silty Clay		5.09
NSB-21	SSDTF780	24.0	12/14/1998	Silty Clay		8.47
NSB-21	SSDTF781	27.0	12/14/1998	Silty Clay	Refusal - TD @ 28.0 ft.	10.3
NSB-22	SSDTF782	12.0	12/14/1998	Clayey Silt	Geotextile Liner @ 10.0 ft.	2.42
NSB-22	SSDTF783	15.0	12/14/1998	Clayey Silt		7.91
NSB-22	SSDTF784	18.0	12/14/1998	Clayey Silt		5.78
NSB-22	SSDTF785	21.0	12/14/1998	Silty Clay		10.6
NSB-22	SSDTF786	24.0	12/14/1998	Silty Clay	Refusal - TD @ 25.0 ft.	7.12
NSB-23	SSDTF787	12.0	12/14/1998	Clayey Silt	Geotextile Liner @ 10.0 ft.	**77.6**
NSB-23	SSDTF788	15.0	12/14/1998	Clayey Silt		**180**
NSB-23	SSDTF789	15.5	12/14/1998	Clayey Silt	**Field Duplicate (SSDTF788)**	**77**
NSB-23	SSDTF790	18.0	12/14/1998	Clayey Silt		33.6
NSB-23	SSDTF791	21.0	12/14/1998	Silty Clay		29.6
NSB-23	SSDTF792	24.0	12/14/1998	Silty Clay		13.2
NSB-23	SSDTF793	27.0	12/14/1998	Silty Clay		17.3
NSB-23	SSDTF794	30.0	12/14/1998	Silty Clay	TD @ 30.5 ft	13.7

Table 5-11. Nitrate Delineation Results, LEHR Southwest Trenches Area Removal Action (continued)

Nitrate Soil Boring	Sample ID	Depth (ft bgs)	Date	Soil Matrix	Notes	Nitrate Conc. (mg/kg)
NSB-24	SSDTF795	12.0	12/15/1998	Clayey Silt		**179**
NSB-24	SSDTF796	15.0	12/15/1998	Clayey Silt		**104**
NSB-24	SSDTF797	18.0	12/15/1998	Clayey Silt		**51.3**
NSB-24	SSDTF798	21.0	12/15/1998	Silty Clay		**40.7**
NSB-24	SSDTF799	24.0	12/15/1998	Silty Clay		22.2
NSB-24	SSDTF800	27.0	12/15/1998	Silty Clay		21.7
NSB-24	SSDTF801	30.0	12/15/1998	Silty Clay	TD @ 30.5 ft	25
NSB-25	SSDTF802	12.0	12/15/1998	Clayey Silt		**49.2**
NSB-25	SSDTF803	12.5	12/15/1998	Clayey Silt	**Field Duplicate (SSDTF802)**	**79.8**
NSB-25	SSDTF804	15.0	12/15/1998	Clayey Silt		**57.7**
NSB-25	SSDTF805	18.0	12/15/1998	Clayey Silt		**50.6**
NSB-25	SSDTF806	21.0	12/15/1998	Silty Clay		**48.6**
NSB-25	SSDTF807	24.0	12/15/1998	Silty Clay	Refusal - TD @ 25.0 ft.	**40.6**
NSB-26	SSDTF808	3.0	12/15/1998	Silty Clay		6.05
NSB-26	SSDTF809	6.0	12/15/1998	Clayey Silt		18.9
NSB-26	SSDTF810	9.0	12/15/1998	Clayey Silt		31.1
NSB-26	SSDTF811	12.0	12/15/1998	Clayey Silt		26.4
NSB-26	SSDTF812	15.0	12/15/1998	Clayey Silt		**41.1**
NSB-26	SSDTF813	15.5	12/15/1998	Clayey Silt	**Field Duplicate (SSDTF812)**	**52.2**
NSB-26	SSDTF814	18.0	12/15/1998	Clayey Silt		35.9
NSB-26	SSDTF815	21.0	12/15/1998	Silty Clay		29.3
NSB-26	SSDTF816	24.0	12/15/1998	Silty Clay		16.3
NSB-26	SSDTF817	27.0	12/15/1998	Silty Clay		17.4
NSB-26	SSDTF818	30.0	12/15/1998	Silty Clay	TD @ 30.5 ft	16.5
NSB-27	SSDTF819	3.0	12/15/1998	Clayey Silt		5.13
NSB-27	SSDTF820	6.0	12/15/1998	Clayey Silt		0.814
NSB-27	SSDTF821	9.0	12/15/1998	Clayey Silt		<1.0
NSB-27	SSDTF822	12.0	12/15/1998	Clayey Silt		<1.0
NSB-27	SSDTF823	15.0	12/15/1998	Clayey Silt		<1.0
NSB-27	SSDTF824	15.5	12/15/1998	Clayey Silt	**Field Duplicate (SSDTF823)**	18.2
NSB-27	SSDTF825	18.0	12/15/1998	Clayey Silt		18.8
NSB-27	SSDTF826	21.0	12/15/1998	Silty Clay		5.05
NSB-27	SSDTF827	24.0	12/15/1998	Silty Clay		2.03
NSB-27	SSDTF828	27.0	12/15/1998	Silty Clay	Refusal - TD @ 28.0 ft.	2.14
NSB-28	SSDTF829	3.0	12/15/1998	Clayey Silt		9.22
NSB-28	SSDTF830	6.0	12/15/1998	Clayey Silt		30.3
NSB-28	SSDTF831	9.0	12/15/1998	Clayey Silt		**41.9**
NSB-28	SSDTF832	12.0	12/15/1998	Clayey Silt		**45.2**
NSB-28	SSDTF833	12.5	12/15/1998	Clayey Silt	**Field Duplicate (SSDTF832)**	**50.7**
NSB-28	SSDTF834	15.0	12/15/1998	Clayey Silt		**56.2**
NSB-28	SSDTF835	18.0	12/15/1998	Clayey Silt		**52.6**
NSB-28	SSDTF836	21.0	12/15/1998	Silty Clay		**37.2**
NSB-28	SSDTF837	24.0	12/15/1998	Silty Clay		14
NSB-28	SSDTF838	27.0	12/15/1998	Silty Clay		14.8
NSB-28	SSDTF839	30.0	12/15/1998	Silty Clay	TD @ 30.5 ft	13.8
NSB-29	SSDTF840	6.0	12/16/1998	Clayey Silt		2.61
NSB-29	SSDTF841	9.0	12/16/1998	Clayey Silt		6.65
NSB-29	SSDTF842	12.0	12/16/1998	Clayey Silt		**224**
NSB-29	SSDTF843	15.0	12/16/1998	Clayey Silt		**97.5**
NSB-29	SSDTF844	18.0	12/16/1998	Clayey Silt		**62.1**
NSB-29	SSDTF845	21.0	12/16/1998	Silty Clay		**52.2**
NSB-29	SSDTF846	24.0	12/16/1998	Silty Clay		**40.3**
NSB-29	SSDTF847	24.5	12/16/1998	Silty Clay	**Field Duplicate (SSDTF846)**	21.1
NSB-29	SSDTF848	27.0	12/16/1998	Silty Clay		28.4
NSB-29	SSDTF849	30.0	12/16/1998	Silty Clay	TD @ 30.5 ft	22.7

Table 5-11. Nitrate Delineation Results, LEHR Southwest Trenches Area Removal Action (continued)

Nitrate Soil Boring	Sample ID	Depth (ft bgs)	Date	Soil Matrix	Notes	Nitrate Conc. (mg/kg)
NSB-30	SSDTF850	12.0	12/16/1998	Clayey Silt	Geotextile Liner @ 10.0 ft.	**699**
NSB-30	SSDTF851	12.5	12/16/1998	Clayey Silt	**Field Duplicate (SSDTF850)**	**822**
NSB-30	SSDTF852	15.0	12/16/1998	Clayey Silt		**145**
NSB-30	SSDTF853	18.0	12/16/1998	Clayey Silt		**49.1**
NSB-30	SSDTF854	21.0	12/16/1998	Silty Clay		**39.9**
NSB-30	SSDTF855	24.0	12/16/1998	Silty Clay	Refusal - TD @ 25.0 ft.	28.2
NSB-31	SSDTF856	12.0	12/16/1998	Clayey Silt	Geotextile Liner @ 10.0 ft.	11
NSB-31	SSDTF857	15.0	12/16/1998	Clayey Silt		**673**
NSB-31	SSDTF858	18.0	12/16/1998	Clayey Silt		21.7
NSB-31	SSDTF859	21.0	12/16/1998	Silty Clay		41
NSB-31	SSDTF860	21.5	12/16/1998	Silty Clay	**Field Duplicate (SSDTF859)**	27.7
NSB-31	SSDTF861	24.0	12/16/1998	Silty Clay		**46.2**
NSB-31	SSDTF862	27.0	12/16/1998	Silty Clay		25.3
NSB-31	SSDTF863	30.0	12/16/1998	Silty Clay	TD @ 30.5 ft	**41.6**
NSB-32	SSDTF864	9.0	12/16/1998	Clayey Silt		7.81
NSB-32	SSDTF865	9.5	12/16/1998	Clayey Silt	**Field Duplicate (SSDTF864)**	7.85
NSB-32	SSDTF866	12.0	12/16/1998	Clayey Silt		18.4
NSB-32	SSDTF867	15.0	12/16/1998	Clayey Silt		14
NSB-32	SSDTF868	18.0	12/16/1998	Clayey Silt		6.65
NSB-32	SSDTF869	21.0	12/16/1998	Silty Clay		4.02
NSB-32	SSDTF870	24.0	12/16/1998	Silty Clay	Refusal - TD @ 25.0 ft.	4.43
NSB-33	SSDTF871	3.0	12/16/1998	Clayey Silt		10.7
NSB-33	SSDTF872	6.0	12/16/1998	Sandy Silt		4.69
NSB-33	SSDTF873	9.0	12/16/1998	Clayey Silt		2.46
NSB-33	SSDTF874	12.0	12/16/1998	Clayey Silt		2.59
NSB-33	SSDTF875	15.0	12/16/1998	Clayey Silt		6.08
NSB-33	SSDTF876	18.0	12/16/1998	Clayey Silt		5.68
NSB-33	SSDTF877	21.0	12/16/1998	Silty Clay		5.35
NSB-33	SSDTF878	24.0	12/16/1998	Silty Clay		5.92
NSB-33	SSDTF879	27.0	12/16/1998	Silty Clay		7.39
NSB-33	SSDTF880	30.0	12/16/1998	Silty Clay	TD @ 30.5 ft	12.7
NSB-34	SSDTF881	3.0	12/16/1998	Sandy Silt		9.07
NSB-34	SSDTF882	6.0	12/16/1998	Clayey Silt		5.82
NSB-34	SSDTF883	9.0	12/16/1998	Clayey Silt		4.46
NSB-34	SSDTF884	12.0	12/16/1998	Clayey Silt		2.41
NSB-34	SSDTF885	15.0	12/16/1998	Clayey Silt		5.72
NSB-34	SSDTF886	15.5	12/16/1998	Clayey Silt	**Field Duplicate (SSDTF885)**	6.23
NSB-34	SSDTF887	18.0	12/16/1998	Clayey Silt		4.4
NSB-34	SSDTF888	21.0	12/16/1998	Silty Clay		4.51
NSB-34	SSDTF889	24.0	12/16/1998	Silty Clay		4.1
NSB-34	SSDTF890	26.0	12/16/1998	Silty Clay	Refusal - TD @ 26.5 ft.	5.43
NSB-35	SSDTF891	3.0	12/17/1998	Sandy Silt		7
NSB-35	SSDTF892	6.0	12/17/1998	Clayey Silt		3.46
NSB-35	SSDTF893	9.0	12/17/1998	Clayey Silt		**36.2**
NSB-35	SSDTF894	12.0	12/17/1998	Clayey Silt		**42.9**
NSB-35	SSDTF895	15.0	12/17/1998	Clayey Silt		10.4
NSB-35	SSDTF896	18.0	12/17/1998	Clayey Silt		5.02
NSB-35	SSDTF897	21.0	12/17/1998	Silty Clay		7.22
NSB-35	SSDTF898	24.0	12/17/1998	Silty Clay		10.7
NSB-35	SSDTF899	27.0	12/17/1998	Silty Clay		13.4
NSB-35	SSDTF900	29.0	12/17/1998	Silty Clay	Refusal TD @ 29.5 ft.	14.9

Table 5-11. Nitrate Delineation Results, LEHR Southwest Trenches Area Removal Action (continued)

Nitrate Soil Boring	Sample ID	Depth (ft bgs)	Date	Soil Matrix	Notes	Nitrate Conc. (mg/kg)
NSB-36	SSDTF901	3.0	12/17/1998	Clayey Silt		3.34
NSB-36	SSDTF902	6.0	12/17/1998	Clayey Silt		25.9
NSB-36	SSDTF903	9.0	12/17/1998	Clayey Silt		19.6
NSB-36	SSDTF904	9.5	12/17/1998	Clayey Silt	**Field Duplicate (SSDTF903)**	7.64
NSB-36	SSDTF905	12.0	12/17/1998	Clayey Silt		7.82
NSB-36	SSDTF906	15.0	12/17/1998	Clayey Silt		10.3
NSB-36	SSDTF907	18.0	12/17/1998	Clayey Silt		8.68
NSB-36	SSDTF908	21.0	12/17/1998	Silty Clay	Refusal TD @ 22.0 ft.	9.99
NSB-37	SSDTF909	3.0	12/17/1998	Clayey Silt		**50.9**
NSB-37	SSDTF910	3.5	12/17/1998	Clayey Silt	**Field Duplicate (SSDTF909)**	**75.9**
NSB-37	SSDTF911	6.0	12/17/1998	Clayey Silt		11.5
NSB-37	SSDTF912	9.0	12/17/1998	Clayey Silt		**47**
NSB-37	SSDTF913	12.0	12/17/1998	Clayey Silt		**62**
NSB-37	SSDTF914	15.0	12/17/1998	Clayey Silt		18.1
NSB-37	SSDTF915	18.0	12/17/1998	Clayey Silt		34.7
NSB-37	SSDTF916	21.0	12/17/1998	Silty Clay		21.8
NSB-37	SSDTF917	24.0	12/17/1998	Silty Clay		14.1
NSB-37	SSDTF918	27.0	12/17/1998	Silty Clay		20.1
NSB-37	SSDTF919	29.0	12/17/1998	Silty Clay	Refusal TD @ 29.5 ft.	30.5
NSB-38	SSDTF920	3.0	12/17/1998	Clayey Silt		4.03
NSB-38	SSDTF921	6.0	12/17/1998	Clayey Silt		**48.4**
NSB-38	SSDTF922	9.0	12/17/1998	Clayey Silt		**41**
NSB-38	SSDTF923	12.0	12/17/1998	Clayey Silt		**50.8**
NSB-38	SSDTF924	15.0	12/17/1998	Clayey Silt		15.2
NSB-38	SSDTF925	18.0	12/17/1998	Clayey Silt		34
NSB-38	SSDTF926	21.0	12/17/1998	Silty Clay		18.8
NSB-38	SSDTF927	21.5	12/17/1998	Silty Clay	**Field Duplicate (SSDTF926)**	16.8
NSB-38	SSDTF928	24.0	12/17/1998	Silty Clay		23.3
NSB-38	SSDTF929	27.0	12/17/1998	Silty Clay		25.3
NSB-38	SSDTF930	30.0	12/17/1998	Silty Clay	TD @ 30.5 ft.	7.82
NSB-39	SSDTF931	3.0	12/17/1998	Sandy Silt		**67.4**
NSB-39	SSDTF932	6.0	12/17/1998	Clayey Silt		4.68
NSB-39	SSDTF933	9.0	12/17/1998	Clayey Silt		**51.2**
NSB-39	SSDTF934	12.0	12/17/1998	Clayey Silt		29.2
NSB-39	SSDTF935	15.0	12/17/1998	Clayey Silt		**37.4**
NSB-39	SSDTF936	15.5	12/17/1998	Clayey Silt	**Field Duplicate (SSDTF935)**	**37.8**
NSB-39	SSDTF937	18.0	12/17/1998	Clayey Silt		26.4
NSB-39	SSDTF938	21.0	12/17/1998	Silty Clay		25.1
NSB-39	SSDTF939	24.0	12/17/1998	Silty Clay		28.1
NSB-39	SSDTF940	27.0	12/17/1998	Silty Clay	Refusal TD @ 28.0 ft.	22.3
NSB-40	SSDTF941	3.0	12/18/1998	Sandy Silt		7.75
NSB-40	SSDTF942	6.0	12/18/1998	Clayey Silt		30.4
NSB-40	SSDTF943	9.0	12/18/1998	Clayey Silt		30.4
NSB-40	SSDTF944	12.0	12/18/1998	Clayey Silt		27.2
NSB-40	SSDTF945	15.0	12/18/1998	Clayey Silt		**39.6**
NSB-40	SSDTF946	18.0	12/18/1998	Clayey Silt		22.5
NSB-40	SSDTF947	18.5	12/18/1998	Clayey Silt	**Field Duplicate (SSDTF946)**	27.7
NSB-40	SSDTF948	21.0	12/18/1998	Silty Clay		22.7
NSB-40	SSDTF949	24.0	12/18/1998	Silty Clay		15.8
NSB-40	SSDTF950	27.0	12/18/1998	Silty Clay		25.2
NSB-40	SSDTF951	30.0	12/18/1998	Silty Clay	TD @ 30.5 ft.	17.2

Table 5-11. Nitrate Delineation Results, LEHR Southwest Trenches Area Removal Action (continued)

Nitrate Soil Boring	Sample ID	Depth (ft bgs)	Date	Soil Matrix	Notes	Nitrate Conc. (mg/kg)
NSB-06	SSDTF952	3.0	12/18/1998	Clayey Silt		7.97
NSB-06	SSDTF953	6.0	12/18/1998	Clayey Silt		**48.4**
NSB-06	SSDTF954	9.0	12/18/1998	Clayey Silt		**69**
NSB-06	SSDTF955	12.0	12/18/1998	Clayey Silt		**174**
NSB-06	SSDTF956	15.0	12/18/1998	Clayey Silt		**169**
NSB-06	SSDTF957	18.0	12/18/1998	Clayey Silt		**83.5**
NSB-06	SSDTF958	18.5	12/18/1998	Clayey Silt	**Field Duplicate (SSDTF957)**	73.9
NSB-06	SSDTF959	21.0	12/18/1998	Silty Clay		**37.7**
NSB-06	SSDTF960	24.0	12/18/1998	Silty Clay		15.1
NSB-06	SSDTF961	27.0	12/18/1998	Silty Clay		27.8
NSB-06	SSDTF962	30.0	12/18/1998	Silty Clay	TD @ 30.5 ft	13.2

Abbreviations

ft bgs feet below ground surface
mg/kg milligrams per kilogram
TD total depth of boring

Notes

Boldface identifies data points exceeding the Nitrate Screening Criterion of 36 micrograms per kilogram.

Table 5-12. Analytical Results for the Designated Level Evaluation Soil Samples, Southwest Trenches Area Removal Action

Sample ID	Activity (pCi/g)	Matrix	Sample Location	Depth (ft)
Southwest Trenches Designated Level Tritium Sampling				
SSDTDL01	0.114	Fill, Clayey Silt	DL-1	10
SSDTDL02	0.237	Clayey Silt	DL-1	15
SSDTDL03	-0.352	Silty Clay	DL-1	20
SSDTDL04	0.117	Silty Clay	DL-1	25
SSDTDL05	-0.233	Silty Clay	DL-1	30
SSDTDL06	0	Fill, Clayey Silt	DL-2	10
SSDTDL07	0.234	Clayey Silt	DL-2	15
SSDTDL08	0	Clayey Silt	DL-2	20
SSDTDL09 (FD)	0.118	Clayey Silt	DL-2	20
SSDTDL10	-0.118	Clayey silt	DL-2	25
SSDTDL11	0.35	Clayey Silt	DL-2	30
Southwest Trenches Designated Level Carbon-14 Sampling				
SSDTDL12	0.85	Fill, Clayey Silt	DL-3	10
SSDTDL13	0.227	Clayey Silt	DL-3	15
SSDTDL14	0.687	Clayey silt	DL-3	20
SSDTDL15 (FD)	0.462	Clayey Silt	DL-3	20
SSDTDL16	0.359	Clayey Silt	DL-3	25
SSDTDL17	0.38	Clayey Silt	DL-3	30
SSDTDL18	0.552	Silty Clay	DL-3	35
SSDTDL19	0.194	Silty Clay	DL-3	40
SSDTDL20	0.194	Silty Sand	DL-3	45
SSDTDL21	0.352	Fill, Clayey Silt	DL-4	10
SSDTDL22	0.0727	Clayey Silt	DL-4	15
SSDTDL23	0.0811	Clayey Silt	DL-4	20
SSDTDL24	0.122	Clayey Silt	DL-4	25
SSDTDL25	0.0219	Clayey Silt	DL-4	30
SSDTDL26 (FD)	0.081	Clayey Silt	DL-4	30
SSDTDL27	0.204	Silty Clay	DL-4	35
SSDTDL28	0.159	Silty Clay	DL-4	40
SSDTDL29	-0.0139	Silty Sand	DL-4	45
Southwest Trenches Designated Level Cesium-137 Sampling				
SSDTDL30	0	Fill, Clayey Silt	DL-5	10
SSDTDL31	0.000161	Clayey Silt	DL-5	15
SSDTDL32	0.00718	Clayey Silt	DL-5	20
SSDTDL33	0.00198	Clayey Silt	DL-5	25
SSDTDL34	0.00215	Clayey Silt	DL-5	30
SSDTDL35	-0.00101	Fill, Clayey Silt	DL-6	10
SSDTDL35	-0.000629	Clayey Silt	DL-6	15
SSDTDL37	-0.00147	Clayey Silt	DL-6	20
SSDTDL38 (FD)	-0.000632	Clayey Silt	DL-6	20
SSDTDL39	0.00176	Clayey Silt	DL-6	25
SSDTDL40	-0.000069	Clayey Silt	DL-6	30

Abbreviations

pCi/g	picoCuries per gram
ft	feet
ID	identification

Table 5-13. Generalized Lithology, Southwest Trenches Removal Action, LEHR Site, UC Davis, California

Approximate Depths (ft bgs)	Modifier and Main Constituent	Density, Plasticity, Sorting	Estimated Permeability
0.0 – 4.0	Sandy Silt	Medium Stiff, Very Low Plasticity	Low-Moderate
4.0 – 17.0	Clayey Silt	Medium Stiff, Low Plasticity	Low
17.0 – 25.0	Clayey Silt	Stiff, Low Plasticity – Medium Plasticity	Very Low
25.0 – 26.5	Silty Sand	Medium Dense, Non-plastic, Well-Sorted	Moderate-High
26.5 – 41.0	Silty Clay	Stiff, Medium Plasticity	Very Low
41.0 – 50.0	Silty Sand	Medium Dense, Very Low Plasticity, Well-Sorted	Moderate-High

Abbreviations
bgs below ground surface
ft feet

Table 5-14. Analytical Results for the Air Monitoring Samples Collected during the Removal Action, LEHR Southwest Trenches Area Removal Action

		Removal Action			Non-Removal Action						
Category	Chemical of Concern	Air Samples during Southwest Trenches Removal	Maximum Air Data during Southwest Trenches Removal [mg/m^3]	Average Air Data during Southwest Trenches Removal [mg/m^3]	Maximum LEHR Data [mg/m^3]	Average LEHR Data [mg/m^3]	Background LEHR Data [mg/m^3]	PRG* [mg/m^3]	Is Max RA > Max Non RA?	Is Max RA Conc > PRG*?	95% UCL of Data
Metals	Aluminum	21	0.82	0.20	NA	NA	1.8E-01	1.8E-01[b]	Yes	Yes	0.29
Metals	Barium	21	1.6E-02	4.8E-03	NA	NA	3.8E-03	5.2E-01	Yes	No	6.4E-03
Metals	Beryllium	5	7.0E-05	5.0E-05	2.1E-04	7.0E-05	NA	8.0E-04	No	No	1.2E-04
Metals	Cadmium	5	5.7E-06	5.4E-06	NA	NA	NA	1.1E-03	Yes	No	5.4E-06
Metals	Calcium	21	0.68	0.18	NA	NA	9.9E-02	9.9E-02[b]	Yes	Yes	0.27
Metals	Chromium	7	7.8E-03	3.5E-03	5.7E-02	8.3E-03	7.4E-03	2.3E-05	No	Yes	1.2E-02
Metals	Copper	21	3.1E-01	2.3E-02	3.5E-01	3.7E-02	1.4E-01	4.5E-02[b]	No	Yes	4.4E-02
Metals	Iron	21	1.6	0.37	NA	NA	2.9E-01	2.9E-01[b]	Yes	Yes	0.55
Metals	Lead	5	3.5E-03	2.3E-03	NA	NA	NA	50[c]	Yes	No	3.0E-02
Metals	Magnesium	22	0.93	0.23	NA	NA	5.2E-01	3.4E-01	Yes	Yes	0.30
Metals	Manganese	19	3.4E-02	9.4E-03	NA	NA	NA	5.1E-02	Yes	No	1.3E-02
Metals	Nickel	6	8.6E-03	4.5E-03	NA	NA	NA	1E03[c]	Yes	No	7.6E-03
Metals	Potassium	21	0.38	9.1E-02	NA	NA	6.1E-02	6.1E-02[b]	Yes	Yes	0.14
Metals	Silver	1	1.7E-03	1.7E-03	NA	NA	NA	10[c]	Yes	No	NA
Metals	Sodium	21	0.76	0.28	NA	NA	3.1E-01	3.1E-01[b]	Yes	Yes	0.37
Metals	Vanadium	10	4.2E-03	2.0E-03	NA	NA	NA	1.0E03[c]	Yes	No	2.6E-03
Metals	Zinc	16	2.3E-02	7.1E-03	NA	NA	NA	None	Yes	No	9.9E-03
Pesticides	alpha-Chlordane	2	3.0E-03	1.7E-03	6.5E-05	4.0E-05	5.5E-05	1.9E-02	Yes	No	4.3E-04
Pesticides	Chlordane	2	2.6E-02	1.7E-02	NA	NA	NA	1.9E-02	Yes	Yes	7.5E-02
Pesticides	gamma-Chlordane	2	2.4E-03	1.6E-03	1.4E-04	5.8E-05	7.2E-05	1.9E-02	Yes	No	4.5E-04
Pesticides	Heptachlor	2	1.7E-03	1.0E-03	9.1E-05	4.5E-05	3.8E-05	1.5E-03	Yes	Yes	3.5E-04
Radionuclides[a]	Actinium-228	5	1.7E-03	8.2E-04	1.9E-03	7.5E-04	1.1E-03	None[d]	No	No	9.6E-04
Radionuclides[a]	Bismuth-212	5	3.4E-03	1.2E-03	2.0E-03	9.0E-04	1.1E-03	None[d]	Yes	No	1.2E-03
Radionuclides[a]	Bismuth-214	5	9.2E-04	5.7E-04	9.0E-04	4.0E-04	5.8E-04	2.0E+03[d]	Yes	No	5.0E-04
Radionuclides[a]	Cesium-134	5	1.8E-04	7.9E-05	3.8E-04	1.3E-04	9.2E-05	None[d]	No	No	1.8E-04
Radionuclides[a]	Cesium-137	5	5.2E-04	3.3E-04	1.2E-03	1.8E-04	6.9E-04	4.0E+02[d]	No	No	1.9E-04
Radionuclides[a]	Cobalt-60	5	1.0E-03	2.6E-04	7.6E-04	2.2E-04	3.5E-04	None[d]	Yes	No	3.0E-04
Radionuclides[a]	Lead-210	5	4.2E-02	1.3E-02	1.1E-01	3.0E-02	3.8E-02	None[d]	No	No	3.5E-02
Radionuclides[a]	Lead-212	5	5.2E-04	3.6E-04	1.1E-03	3.7E-04	5.7E-04	80[d]	No	No	4.4E-04
Radionuclides[a]	Lead-214	5	8.7E-04	4.1E-04	8.4E-04	3.5E-04	5.3E-04	2.0E+03[d]	Yes	No	4.5E-04
Radionuclides[a]	Potassium-40	5	5.1E-03	4.2E-03	6.8E-03	3.5E-03	5.5E-03	9.0E+02[d]	No	No	4.0E-03
Radionuclides[a]	Radium-226	10	1.0E-03	4.0E-04	3.8E-03	6.3E-04	7.6E-04	1.0[d]	No	No	1.0E-03
Radionuclides[a]	Strontium-89/90	5	2.1E-04	1.9E-04	6.1E-02	2.2E-03	3.1E-02	9.0[d]	No	No	NA
Radionuclides[a]	Thallium-208	5	3.4E-04	2.2E-04	6.0E-04	2.1E-04	2.5E-04	None[d]	No	No	2.5E-04
Radionuclides[a]	Thorium-228	5	9.4E-05	7.3E-05	2.0E-04	8.3E-05	1.5E-04	4.0E-02[d]	No	No	9.3E-05
Radionuclides[a]	Thorium-230	5	8.5E-05	6.9E-05	1.6E-04	5.9E-05	9.4E-05	4.0E-02[d]	No	No	6.9E-05
Radionuclides[a]	Thorium-232	5	9.9E-05	6.1E-05	1.6E-04	6.6E-05	1.2E-04	7.0E-03[d]	No	No	7.3E-05
Radionuclides[a]	Thorium-234	5	1.1E-02	8.9E-03	2.7E-02	3.9E-03	1.6E-02	None[d]	No	No	4.8E-03
Radionuclides[a]	Tritium	6	8.4	3.2	6.8	1.2	5.9	1.0E+05[d]	Yes	No	1.1
Radionuclides[a]	Uranium-233/234	5	6.4E-05	5.0E-05	3.1E-04	1.2E-04	1.7E-04	9.0E-02[d]	No	No	1.4E-04
Radionuclides[a]	Uranium-235	10	1.5E-03	4.3E-04	2.2E-03	4.4E-04	1.2E-03	0.10[d]	No	No	5.2E-04
Radionuclides[a]	Uranium-238	5	6.2E-05	4.4E-05	2.1E-04	8.6E-05	1.3E-04	0.10[d]	No	No	1.0E-04
VOC	1,2,4-Trichlorobenzene	4	13	7.1	12	4.8	7.8	2.1E+02	Yes	No	6.0
VOC	1,2,4-Trimethylbenzene	6	4.5	2.8	7.9	3.1	5.1	6.2	No	No	3.8
VOC	1,4-Dioxane	19	51	18	NA	NA	NA	6.1E-02	Yes	Yes	25
VOC	Acetone	24	56	16	NA	NA	NA	3.7E+02	Yes	No	23
VOC	Benzene	19	18	2.8	5.1	2.1	3.3	2.3E-01	Yes	Yes	3.0

Table 5-14. Analytical Results for the Air Monitoring Samples Collected during the Removal Action, LEHR Southwest Trenches Area Removal Action (continued

Category	Chemical of Concern	Removal Action			Non-Removal Action			PRG* [mg/m^3]	Is Max RA > Max Non RA?	Is Max RA Conc > PRG*?	95% UCL of Data
		Air Samples during Southwest Trenches Removal	Maximum Air Data during Southwest Trenches Removal [mg/m^3]	Average Air Data during Southwest Trenches Removal [mg/m^3]	Maximum LEHR Data [mg/m^3]	Average LEHR Data [mg/m^3]	Background LEHR Data [mg/m^3]				
VOC	Bromomethane	13	5.1	2.4	6.2	2.5	4.0	5.2	No	No	2.4
VOC	Chlorobenzene	4	33	12	8.0	3.2	4.8	21	Yes	Yes	4.0
VOC	Chloromethane	24	3.2	1.6	3.3	1.5	2.3	1.1	No	Yes	1.8
VOC	Ethanol	24	42	13	NA	NA	16	9.6[b]	Yes	No	20
VOC	Freon 11	22	2.5	1.8	NA	NA	NA	None	Yes	No	2.0
VOC	Freon 114	1	4.8	4.8	NA	NA	NA	None	Yes	No	NA
VOC	Freon 12	24	4.6	3.4	NA	NA	NA	None	Yes	No	3.6
VOC	m,p-Xylene	8	8.8	2.5	NA	NA	NA	7.3E+02	Yes	No	1.4
VOC	Methylene Chloride	21	9.2	3.1	8.3	3.4	5.7	4.1	Yes	Yes	6.3
VOC	Toluene	18	6.9	2	280	8.4	NA	4.0E+02	No	No	37

Abbreviations

LEHR Laboratory for Energy-Related Health Research
Max maximum
mg/m^3 milligrams per cubic meter
NA Not applicable, either compound was not detected in previous monitoring or not analyzed
PRG preliminary remediation goal
RA Removal Action

Notes

* PRG if compound does not have PRG limit other standards are used for comparison
a all radionuclides have units of picoCuries per cubic meter
b Average concentration of background data
c Occupational Safety and Health Administration permissible exposure limit
d Derived Concentration Guide

6. PHASE II DATA EVALUATION

The Southwest Trenches RA data were evaluated in two phases.

- Phase I occurred immediately following the RA and was based on field screening sample results. The screening data were used to guide the excavation activities. The Phase I Data Evaluation was presented to DOE and the RPMs on September 16, 1998 and is summarized in Section 5; and,
- Phase II is described in this section and was completed after all analytical results from the October 1998 confirmation sampling and follow-up October 1999 DL sampling were received. Figure 6-1 presents the Phase II Data Evaluation process.

During Phase II Data Evaluation, confirmation sampling results were tabulated according to chemical group and risk, and DL analyses were then completed. These analyses were used to determine whether the RAOs presented in Section 1.2 were attained and, if not, make recommendations on any additional actions required. Each analysis is described below.

6.1 Data Reduction/Verification/Reporting and Records Management

Obtaining valid and comparable data requires adequate quality assurance/quality control (QA/QC) procedures and documentation. The quality assurance requirements applicable to the RA activities are detailed in the *Final Quality Assurance Project Plan (QAPP) for the Environmental Restoration Activities at the LEHR Site* (WA, 1998j). The QAPP was based upon the requirements of DOE Order 5700.6c "Quality Assurance" and QAMS-005/80 (USEPA, December 19, 1980) "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans" as they are applicable to the scope of work.

Per the QAPP, SAP, and WP, the following activities were conducted to ensure data usability:

- QA/QC for Sample Collection;
- Data Reduction, Verification, Reporting, and Validation; and,
- Data Management.

6.1.1 Quality Assurance/Quality Control Sample Collection

To ensure reliability of field sampling procedures and materials, field QA/QC samples were collected. Seven field duplicates, approximately 10% of the 64 confirmation samples, and one equipment rinsate blank were collected following the RA in October 1998 as required in the QAPP and SAP.

6.1.2 Data Reduction, Verification, Reporting, and Validation

Accurate data reduction, validation, and reporting protocols are necessary to interpret data and make decisions. After the RA confirmation sampling was completed, data reduction, verification, reporting, and validation were performed as outlined in the QAPP, WP, and SAP.

Independent of the laboratory review, WA performed data validation and verification on the analyzed samples using the guidance of the "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review" (USEPA, 1988a) and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review" (USEPA, 1988b). Analytical results were qualified as a result of the data validation process in accordance with the flagging convention included in the QAPP. Data containing substantial untraceable omissions or errors were removed from the database before proceeding to determine the COC concentration terms. The removed data set accounted for less than 1% of all data.

6.1.3 Data Management

The analytical data were compiled in electronic form and entered into the LEHR Microsoft Access database. Only the laboratory data for the 74 COCs were included in the Risk Analysis.

Chemicals and radionuclides reported by the laboratory but that were not one of the 74 COCs were included in the database, but not further evaluated for risk. All COCs are evaluated during the DL analyses. These chemicals and radionuclides were provided by the laboratory at no additional cost since they are included in the standard reports for one or more analytical methods that also included a COC. For example, if a single organic compound was identified as a COC and CLP Method OLM 3.0 was required to analyze for the COC, all of the other organics under that method were also reported by the laboratory.

Some COCs were reported below laboratory detection limits for the soil confirmation samples. Per guidance documents by DOE (DOE, 1991) and USEPA (Gilbert, 1987), the data were managed as follows:

- All radiological results were used in the concentration calculations including negative values, zero values and results below the MDA. All radiological data were used to avoid bias in the 95% upper confidence limit (UCL) value (Gilbert, 1987; DOE, 1991); and,

- For non-radionuclide chemicals, only values above the laboratory detection limit or analytical method detection limit were used to calculate the concentration terms (Gilbert, 1987).

6.2 Risk Analysis

6.2.1 Background Concentrations

Background concentrations of COCs in LEHR-area soil were calculated using analytical results of off-site soil samples and were derived using USEPA-approved statistical methods. This evaluation used background values presented in Appendix D of the Work Plan (WA, 1998a). Specifically, the 80% lower confidence limit of the 95th quantile for the available off-site soil data was selected to represent the background values for each COC.

6.2.2 Risk-Based Action Standards

RBASs for the DOE Areas at the LEHR site were developed and presented in the *Draft Final Determination of Risk-Based Action Standards Report* (WA, 1997b). The RBAS values are site-specific concentrations that yielded the target incremental cancer risk or non-cancer risk for each COC, and were used to guide the extent of excavation during the RA.

The RBAS values represent single COC concentrations, which if present throughout the horizontal and vertical (0 to 15 ft depth) extent of all the DOE areas shown in Figure 6-2, might theoretically result in the specified maximum individual excess risk level (or hazard quotient) to an exposed individual. RBASs were developed using the USEPA guidance for development of risk-based preliminary remediation goals using a back calculation rather than a forward calculation approach for both carcinogenic and non-carcinogenic COCs.

Assuming uniform contamination throughout all of the DOE areas to a depth of 15 ft, as well as using the back-calculation methods, are very health-conservative. Consequently, the calculated action standards are very conservative. The actual excess risk to an exposed individual resulting from contamination at the RBAS values could be negligible or even zero. DOE and the regulatory agencies use the RBAS values to guide RA(s). A subsequent cumulative risk assessment will be conducted after DOE and UC Davis RAs are complete to assess site-wide risk.

6.2.2.1 Risk-Based Action Standard Calculation

Calculating the RBAS values included the following:

- Identifying the COCs (74 chemicals and radionuclides);
- Identifying possible exposure pathways and scenarios;

- Conducting fate and transport modeling to relate on-site concentrations of the 74 COCs to concentrations in exposure media;
- Calculating the chemical dose, or intake, for each COC; and,
- Performing iterative back-calculations to determine the source soil concentration or RBAS that yielded the acceptable incremental cancer or non-cancer risk.

For carcinogenic compounds, the RBASs meet the excess upper bound lifetime cancer risk between 10^{-4} and 10^{-6}. For systemic non-carcinogenic compounds, the RBASs are equivalent to a hazard index of 1.0 (representing no significant adverse effect during a lifetime).

For some of the COCs, the RBAS value is less than the background concentration. Risk assessments evaluate excess or incremental risk due to the presence of contaminants above background or naturally occurring contaminant levels. Background is typically identified as contributing zero excess or incremental risk since the contaminants are present regionally and often naturally occurring. Therefore, in the case where an RBAS value for a particular COC is less than the background concentration, the action standard is set at background. Additionally, if a COC is detected at or below background levels, it is assumed that this COC does not contribute to excess or incremental risk and is therefore removed from the risk analysis.

Three risk exposure scenarios were developed for evaluation in this assessment, and RBAS values were calculated for each scenario. The RBAS values for the 10^{-6} excess cancer risk level and HQ equal to 1.0 for all COCs under each risk scenario are presented in Tables 6-1 and 6-2. Figure 6-2 illustrates the locations of the scenario receptors.

- Scenario 1, On-site Researcher, represents potential on-site workers that may be exposed to source area soil through external radiation from ground surface radionuclides at or near the ground surface (for radionuclides only), ingestion, inhalation and dermal exposure;
- Scenario 2, the East Side Residential Farmer, represents potential off-site residential farmers that may be exposed to potentially impacted ground water, potentially impacted surface water (via recreational use), and via external radiation from radionuclides at or near the ground surface (for radionuclides only), inhalation of fugitive dust, soil ingestion, and agricultural foods potentially impacted by fugitive dust migration from the on-site source areas; and,
- Scenario 3, the South Side Residential Farmer, is identical to Scenario 2 except that exposure to impacted ground water is not included, since ground water flow is generally toward the east, away from this receptor location, and ground water contamination does not impact Putah Creek.

6.2.2.2 Mercury Risk-Based Action Standard Re-calculation

Speciation analyses indicate that mercury in LEHR soils is >99% mercuric sulfide, which is significantly less mobile and less toxic than the forms of mercury assumed in the original RBAS calculations. Furthermore, this form of mercury is not likely to be converted in significant quantities to the more toxic and mobile methyl form (WA, 2000). Based on this, the mercury RBAS for the Southwest Trenches has been recalculated.

The new mercury RBAS was calculated using the same approach used in *Draft Determination for Risk-Based Action Standards for DOE Areas* (WA, 1997b). The calculations were performed for the non-carcinogenic effects related to mercury under Scenario 2, since this scenario shows the greatest potential for mercury exposure, and results in a lower RBAS value than other scenarios. The soil profile used for the calculations is the same as that described in Section 6.4 for the DL modeling and shown in Table 5-13. Chemical properties and toxicity information were obtained from the USEPA Superfund Chemical Data Matrix (USEPA, 1996) and/or Integrated Risk Information System. Because no USEPA-approved reference dose (RfD_0) or soil/water distribution coefficient (K_d) is available for mercuric sulfide, the values for mercuric chloride were used (Appendix D). Because mercuric sulfide is known to be less toxic and less soluble than mercuric chloride, this results in a revised RBAS for mercuric sulfide that is still very conservative. In addition to the mercuric sulfide/mercuric chloride RBAS, an RBAS for methyl mercury was also calculated.

The results of the RBAS recalculation are shown in Appendix D. The new mercuric sulfide/mercuric chloride RBAS is 3.1 mg/kg and the new methyl mercury RBAS is 1.0 mg/kg.

6.2.3 Data Summary

Histograms for the confirmation sample results for each COC and its respective background data set are presented in Appendix E. A detailed discussion of results with regard to each RBAS is presented in Section 6.2.6. The data findings for the 74 COCs include:

- Thirty-three (45%) of the COCs were not detected above the laboratory detection limits. These thirty-three were therefore removed from the risk analysis and DL analysis;
- Forty-two (56%) of the COCs had at least one detected value above the laboratory or analytical detection limits;
- Thirty-five (47%) of the 42 COCs were not detected above their respective background concentrations;
- A 95% UCL on the mean could not be calculated for 43 COCs. Thirty-three COCs were not detected and were removed from the risk analysis. For the other 10 COCs, the maximum detected concentration was used in lieu of a reliable 95% UCL;
- Only 11 COCs had at least one detected value greater than their respective lowest RBAS values; and,
- Only seven COCs had at least one detected value greater than their respective USEPA Region 9 Residential PRG values.

The data summary illustrates that the confirmation sample results are very favorable and indicate the RA was successful.

6.2.4 Reasonable Maximum Exposure

The USEPA guidance (USEPA, 1994) recommends using a reasonable maximum exposure (RME) for Superfund risk assessments. The RME is a conservative estimate of intake and is defined as the highest exposure that could reasonably be expected to occur for a given exposure pathway at a site. The RME accounts for uncertainty in the contaminant concentration.

Per USEPA guidance (USEPA, 1994), statistical calculations were performed for each COC to determine the concentration terms. The statistical calculations included determining the mean, standard deviation, and the 95% UCL on the mean of the SWT Area. The 95% UCL is a statistical value that is often calculated for Superfund sites to conservatively compare remediation unit data to a pre-determined limit such as the RBAS.

EPA recommends that the 95% UCL be used as the concentration term or RME in Superfund assessments because of the uncertainty associated with the true average concentration at a site. The 95% UCL provides reasonable confidence that the true site average concentration will not be underestimated.

The 95% UCL is defined as a value that, when calculated repeatedly for randomly drawn subsets of a site's data, equals or exceeds the true mean for the site's concentration 95% of the time. Though sampling plans are developed to collect an adequate number of samples to characterize the contamination at a site, the true mean of the contamination data set is rarely known or available. Therefore, the 95% UCL is used as the average concentration because it is an available statistical value as opposed to the true mean which typically is not available.

The 95% UCL varies depending on the distribution of the data and the mean for the data set and is calculated as follows for a normally distributed data set:

$$95\%\ UCL = \overline{x} + t_{.05}(S/(N)^{1/2})$$

$\overline{x}$ = Mean of the data set

$t_{.05}$ = Student t value for a one-tailed 95% confidence interval and the representative number of degrees of freedom

S = Standard deviation of the data set

N = Number of samples

Six of the COCs have log normally distributed confirmation data sets: barium, chromium, copper, manganese, zinc, and thorium-232. The following formula is used to calculate the 95% UCL on the mean for these six COCs' data sets:

$$95\%\ UCL = e^{\overline{x}+0.5s^2+sH/(n-1)^{0.5}}$$

e	=	Constant (base of the natural log, equal to 2.718)
$\overline{x}$	=	Mean of the transformed data set
s	=	Standard deviation of the transformed data
H	=	H-statistic (from the table published in Gilbert, 1987)
N	=	Number of samples

Sampling data from Superfund sites have shown that data sets with fewer than ten samples per exposure area provide poor estimates of the mean concentration (USEPA, 1992). Thus, the maximum concentration is selected as the concentration term or RME for the risk analysis. This was the case for 10 of the 74 COCs. Otherwise, the 95% UCL on the mean was calculated to determine the concentration term or RME for the COCs, using USEPA procedures (USEPA, 1992).

6.2.5 Background Comparison

As noted above, values at or below background are assumed not to contribute to excess or incremental risk. If a COC is determined to be at or below background, it is removed from the risk screening analysis.

Background comparisons were performed for eight COCs with an RBAS less than the background value (Table 6-3). Per the USEPA guidance (USEPA, 1994), these comparisons were performed by comparing the data set for the background off-site soil data to the confirmation sampling data set for each applicable COC. For VOCs and SVOC, and pesticides/PCBs where no background data were available, the reported detection limit (RDL) was used for the comparison. USEPA guidance recommends using the WRS Test and the Quantile Test to perform the background comparison. These tests are outlined in the Statistical Method for Evaluating the Attainment of Cleanup Standards, Vol. 3 (USEPA, 1994).

The WRS Test is used to determine whether the RA has uniformly attained the cleanup goal for a particular COC throughout the cleanup unit, whereas the Quantile Test is more appropriate to detect when RA has failed in only a few areas within the cleanup unit.

The results of the WRS Test and Quantile Test from the background comparisons are summarized in Table 6-3. The analysis indicated that seven of the eight COCs with RBAS values less than the background concentration passed the background comparison using both tests. These seven COCs were eliminated from the risk screening since their confirmation data sets were similar to background and were therefore assumed not to contribute to excess or incremental risk at the site.

Manganese passed one of the background comparison tests, the Quantile Test, but did not pass the WRS Test. Manganese failed the WRS Test by a very small margin with a WRS Test statistic value, Z_{rs}, of 1.28 which was less than the required $2_{1-\alpha}$ value of 1.43, based on a Type I decision error of 0.1 and a Type II decision error of 0.2, as agreed to by the USEPA. Histograms of the background and confirmation data sets for manganese were developed and overlain to visually compare their distributions (Figure 6-3). The two data distributions are very similar and overlap considerably, indicating that manganese is present in background concentrations and is not a pollutant at the site. Accordingly, manganese was removed from the risk screening analysis.

6.2.6 Risk Calculation

The risk analysis assessed whether the first and second RAOs for the Southwest Trenches RA were attained. The Risk Analysis decision process is illustrated in Figure 6-4. For each carcinogenic COC with an RBAS above the background concentration, the RME is divided by the RBAS at specified risk levels (10^{-6}, 10^{-5}, and 10^{-4}). The sum of the RME/RBAS ratios for all COCs with an RBAS above the background concentration are then computed for the three risk scenarios. If the sum is less than 1.0, the screening level evaluation concludes that the first RAO has been met. A similar ratio is calculated for the cumulative Hazard Index for non-carcinogenic COCs. If the sum of the RME/RBAS ratios for the non-carcinogens is less than 1.0, the risk analysis concludes the second RAO has been attained.

Below is an example of the calculation method used for the RME to RBAS comparisons.

Individual COC

$$\frac{RME_1}{RBAS_{1Scenario_n}} = \text{ratio of RME to the RBAS for each scenario}$$

where:

RME1 = RME for COC_1

RBAS1 = RBAS for COC_1, in Scenario n

Cumulative carcinogenic COCs

$$\text{cumulative ratio} = \sum \frac{RME_1}{RBAS_{1Scenario_n}} + \frac{RME_2}{RBAS_{2Scenario_n}} + \frac{RME_3}{RBAS_{3Scenario_n}} \cdots + \frac{RME_m}{RBAS_{mScenario_n}}$$

Cumulative non-carcinogenic COCs

$$\text{cumulative ratio} = \sum \frac{RME_1}{RBAS_{1Scenario_n}} + \frac{RME_2}{RBAS_{2Scenario_n}} + \frac{RME_3}{RBAS_{3Scenario_n}} \cdots + \frac{RME_m}{RBAS_{mScenario_n}}$$

Table 6-4 illustrates the RME/RBAS ratios for each COC and each scenario at the 10^{-6} excess cancer risk level and HQ=1.0 non-carcinogenic risk level. Table 6-5 shows the cumulative RME/RBAS ratios for each scenario at the 10^{-6}, 10^{-5}, and 10^{-4} excess cancer risk levels and HQ=1.0 non-carcinogenic risk level.

6.2.6.1 Cancer Risk Calculations

Comparison of the RBAS values to the measured Site soil concentrations indicates that none of the COCs exceed the carcinogenic RBAS values in the Southwest Trenches for the 10^{-6}, 10^{-5}, or 10^{-4} target risk levels in the SWT Area after the RA. Refer to Tables 6-4 and 6-5 for individual carcinogenic COC RME/RBAS ratios and the cumulative carcinogen RME/RBAS ratios, respectively.

Comparison of chemical and radionuclide Site soil concentrations to RBAS values for the 10^{-6}, 10^{-5} and 10^{-4} target excess cancer risk shows:

- At the 10^{-6} target incremental carcinogenic risk level, two radionuclide carcinogenic chemicals are the most significant contributors to the cumulative RME/RBAS ratio of 1.44 for Scenario 1 (On-site Worker):
  - Cs-137 RME/RBAS ratio = 0.54, and
  - Thorium-234 RME/RBAS ratio = 0.27;
- At the 10^{-6} target incremental carcinogenic risk level, one radionuclide carcinogenic chemical is the most significant contributor to the cumulative RME/RBAS ratio of 1.45 for Scenario 2 (East Side Residential Farmer).
  - Am-241 RME/RBAS ratio = 0.78;
- At the 10^{-5} target incremental carcinogenic risk level, none of the cumulative RME/RBAS ratios exceed 1.0; consequently, no significant contributors are identified; and,
- At the 10^{-4} target incremental carcinogenic risk level, none of the cumulative RME/RBAS ratios exceed 1.0; consequently, no significant contributors are identified.

These data demonstrate that the cumulative residual risk for carcinogens falls within the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) risk range of 10^{-4} to 10^{-6} and only slightly exceeds the 10^{-6} level in Scenarios 1 and 2. Thus, RAO No. 1 has been attained as a result of RA activities by reducing the cumulative cancer risk to a nominal range of 10^{-4} to 10^{-6}.

6.2.6.2 Non-Cancer Risk Calculations

As shown in Table 6-4, comparison of the RBAS values to the measured Site soil concentrations indicates that none of the COCs exceeds its non-carcinogenic RBAS value based on a HQ of 1.0 in the SWT Area after the RA. As shown in Table 6-5, the cumulative non-carcinogen RME/RBAS ratio for each of the three scenarios is also below 1.0, the hazard index established as RAO No. 2. Therefore, based on this analysis, RAO No. 2 has been attained following the RA activities by reducing the non-cancer hazard index to below one.

6.2.6.3 Comparisons of Preliminary Remediation Goals to Reasonable Maximum Exposure Values

The residual soil concentrations are compared to the USEPA residential PRGs with the knowledge that future land use plans for the site did not include residences. The residential PRG scenario is therefore included for comparison purposes only and is highly conservative for the following reasons:

- The USEPA PRG values are typically used only for initial screening of a site's contaminant levels. These values are highly conservative and do not take into account site-specific conditions. During a forward risk assessment, site-specific conditions are used, and the values calculated are typically greater, by as much as an order of magnitude or more, than the USEPA PRG limits;
- Future land use planning by UC Davis does not indicate any possibility of future residential land use at this site. Continued use as a research facility is anticipated for the foreseeable future;
- The USEPA PRG values are based on an excess cancer risk level of 10^{-6}, whereas the RAOs for the site-specific scenarios included less conservative cancer risk levels of 10^{-4} and 10^{-5}, as well as the 10^{-6} risk level; and,
- The risk exposure scenarios were evaluated by calculating site-specific RBAS values at 10^{-4}, 10^{-5}, and 10^{-6} cancer risk, and HQ=1.0 non-cancer risk. These RBAS values include conservative assumptions, but are more valid due to site-specific information such as depth to ground water and distance to receptors. The USEPA PRG values, on the other hand, are more conservative so that they can be applied at sites throughout the USEPA region with varying characteristics. In this case, PRG values ranged from one to seven orders of magnitude less than the RBAS values for the exposure scenarios.

The RME values for each COC were compared to the action standards established in the USEPA Region 9, May 1998 PRGs for chemical constituents and the USEPA Region 9 December 1996 PRGs for radionuclides. All of the non-carcinogenic COCs are below their respective residential PRG values. Five of the carcinogenic COCs marginally exceed their respective residential PRG values (Table 6-6).

6.2.7 Hot Measurement Analysis

A Hot-Measurement Analysis (USEPA, 1994) was also performed to determine if any concentrations in the remediation cleanup unit for each COC exceeded their respective upper limit concentration value. If so, then further evaluation or additional remedial action is required, at least locally, for the areas with hot measurements, regardless of the outcome of the Background Comparisons using the WRS and Quantile Tests or the Risk Screening Analysis.

The Hot-Measurement Analysis is typically used in Background Comparisons in conjunction with the WRS and Quantile Tests to help ensure that unusually large sampling data measurements will receive proper attention regardless of the outcome of the WRS and Quantile Tests. Due to the de-emphasis of high data measurements when grouped with the entire data set, the WRS and Quantile Tests may indicate that the remedial action is complete in spite of a few very high measurements in the cleanup unit.

For this Phase II Data Evaluation, a Hot-Measurement Analysis was performed on all COCs regardless of whether they were included in the Background Comparison to determine if measurements in the remediation cleanup unit (SWT Area) exceeded a value equal to ten times their respective 10^{-6} RBAS values for the carcinogenic COCs, and the RBAS for the non-carcinogenic COCs. The factor of ten times the 10^{-6} RBAS was selected since it would correspond to a 10^{-5} excess cancer risk level, or the median of the three cancer risk levels. The non-carcinogenic RBAS values were treated differently because, in contrast to carcinogens which have various risk levels such as 10^{-6}, 10^{-5}, and 10^{-4}, risk assessments typically use only one risk level for non-carcinogens: HQ=1.0.

The results of the Hot-Measurement Analysis are summarized in Table 6-7. Cs-137 has a single value (1.18 pCi/g) that marginally exceeds the Hot Measurement Upper Limit. This single value is determined not to be significant enough to warrant further action. The value is noted here to ensure that it is included in the future forward risk assessment to be completed by UC Davis. No other COCs were detected at levels exceeding the Hot-Measurement criteria.

6.3 Designated Level Analysis

The third RA objective was to mitigate any potential future impacts to ground water by reducing COC concentrations in soil. To determine whether this objective has been attained, a DL analysis was conducted. The Work Plan specified that DL samples would be collected during confirmation sampling at the time of the RA. DL sampling results would then be incorporated into the DL analysis to determine if residual COC concentrations in soil would impact ground water. However, following completion of the excavation activities, DL sampling was not conducted. The conducted DL analysis deviates from that described in the Work Plan because after the RA, driver COC concentrations did not indicate the presence of any hot spots at the site.

To optimize data collection and lower cost, a phased approach was selected for DL sampling and analysis. The approach consisted of first collecting and evaluating the confirmation analytical results to determine whether any COCs were present at the site above background. A DL sampling could then be implemented that would focus on specific COCs and hot spot areas. The modified DL approach consists of three phases:

- Phase A–Preliminary DL Analysis: Evaluate confirmation sampling results and identify DL COCs and hot spot areas;
- Phase B–Data Gaps Investigation: Collect additional vertical profile data, if needed, for each DL COC at the hot spot area; and,

- Phase C–Refined DL Analysis: Model and calculate the DL values which are protective of ground water using the vertical profile of DL COCs.

Results of Phase A and Phase B, Preliminary and Refined DL Analysis, are presented below. Results of Phase B, Data Gaps Investigation, are presented in Section 5.9 above. Figure 6-5 presents the modified DL analysis decision flow diagram.

6.3.1 Phase A—Preliminary Designated Level Analysis

The preliminary DL analysis was conducted using the confirmation sampling results and includes data management, data evaluation and screening, and discussion/conclusions, as presented below.

6.3.1.1 Data Management

Confirmation sampling data were used to conduct the preliminary DL analysis. Data validation and management for this analysis were identical to that performed for the Risk Analysis. A total of 64 samples were analyzed for the DL analysis. The complete suite of analyses consisted of 171 analytes was tabulated for all 63 samples using the LEHR Microsoft ACCESS database. The compiled data set was then processed through a screening and evaluation step described in the following section.

6.3.1.2 Data Evaluation and Screening

The DL data evaluation and screening consists of four steps as described in detail below. Figure 6-6 is a decision flow diagram for the data evaluation and screening of the preliminary DL Analysis.

6.3.1.2.1 Step 1—Detected versus Non-detected Analytes

Following completion of data validation, a table presenting all analytes that had been detected in at least one sample was generated. Of the 171 total analytes, 105 were not detected in any sample. The majority of the non-detected analytes were SVOCs, VOCs, and pesticides. Analytes not detected in any sample were removed from further DL evaluation. The remaining 66 analytes are shown in Table 6-8 by their analytical group including metals, pesticides, radionuclides, VOCs, and nitrate.

6.3.1.2.2 Step 2—Background Comparison

As shown in Table 6-8, many analytes were detected in only a few samples and at levels that were close to or slightly above background. Step 2 of the data evaluation consisted of comparing the frequency and magnitude of the detected analytes to site background levels. The SC for frequency and magnitude were defined as 5% of the data values detected above background and a maximum concentration of 1.5 times the COC's background level, respectively. The 5% detection frequency was selected based on a 95th quantile calculation of the COC's background value; 5% of a sample population (data set) can be expected to be greater than the 95th quantile value (background). The 1.5 times analyte concentration above background was selected based on review of acceptable error margin in analytical measurements. A detection of 1.5 times background was not considered a significant concentration above background. For organic compounds where no background data were available, the RDL was used for the comparison.

As shown in Table 6-8, metals including antimony, arsenic, barium, cobalt, copper and iron did not exceed background. Similarly, pesticides and VOCs such as dieldrin, PCB-1260, acetone, and methyl bromide had a single detected value above their RDL. Background comparison also eliminated radionuclides such as Pu-241, thorium-232, and uranium-238 from the evaluation. At the completion of the Step 2 analysis, 34 analytes remained for further evaluation.

6.3.1.2.3 Chemical and Physical Properties

Step 3 of the data evaluation consisted of comparing the chemical and physical properties that would determine the fate and transport mechanisms of the analytes in the environment and predict their potential impact to the ground water. Specifically, the soil adsorption coefficient (K_d) and the decay half-life (half-life) of the analytes were used as indicators of the fate and transport in the vadose zone. Table 6-8 presents the K_d and half-life values for the analytes detected above background. In general, K_d values were used to evaluate potential impacts of pesticides and VOCs and half-life was utilized for radionuclides.

K_d values, which represent the relative capacity for a compound to sorb to the surface of a soil particle versus water, were based on data presented in The Handbook of Environmental Degradation Rates (Howard et al., 1991). The smaller the K_d value, the less sorptive (more mobile) the analyte. In this analysis, the lower reported K_d value for the analyte was typically selected to be more conservative. During previous site-specific vadose zone Non-isothermal, Unsaturated Flow and Transport (NUFT) modeling, K_d values for specific organic compounds were correlated to the time for the peak concentration to occur at the water table (time-to-peak). A significant correlation was observed during the site-specific modeling and thus the K_d criterion was selected based on an acceptable time-to-peak for organic compounds. For example, a K_d of 10 milliliters per gram (mL/g) would be equivalent to 2,000 years for the analyte to reach the water table at the peak concentration. The K_d values for pesticides and VOCs were therefore compared to a K_d of 10 mL/g.

As shown in Table 6-8, the K_d for most pesticides exceeds 1000 mL/g, which corresponds to a time-to-peak of over 200,000 years. Therefore, pesticides are not likely to impact ground water and were eliminated during this screening step. Detected VOCs, however, have K_d values in the range of 0.007 to 1.5 mL/g and were therefore retained for further analysis.

The decay half-life for the radionuclides detected at the site was selected from The Handbook of Environmental Degradation Rates (Howard, 1991). A screening criterion of less than one year was chosen for half-life comparison based on the time of last disposal at the site. Since land disposal activity at the site ceased at least 20 years ago, and given that the maximum activity of radionuclides released at LEHR were in the low milliCuries (mCi), radionuclides with half-lives of one year or less should not significantly impact the ground water.

Half-life values for several radionuclides detected at the site are much less than one year and were therefore eliminated from further evaluation. These radionuclides are typically DPs of other radionuclides and have half-lives on the order of minutes or days. For example, lead-214 and bismuth-214 are DPs of radium and have a 20-minute half-life, and therefore do not pose a risk to the ground water. Table 6-8 lists the radionuclides that fail the half-life screening test and were evaluated in Step 4.

6.3.1.2.4 Step 4—WRS/DL/Biodegradability Test

Following Steps 1 through 3, 19 analytes were retained for Step 4 analysis (Table 6-9). For this analysis, the WRS Test was performed on several analytes when applicable. Designated levels calculated for several analytes were also used during Step 4 to determine if the analyte would pose a potential risk to the ground water. In addition, the biodegradability of specific VOCs and the magnitude /frequency of metals and radionuclides were further scrutinized.

The WRS Test, which measures the relative similarity between the background data set and the environmental sample population, is used to indicate whether the confirmation data can be represented by the background distribution. In order to perform this test, at least 40% of the data set should be detected above the detection limit (USEPA 1994). Only a few analytes could be evaluated using the WRS Test: chromium, manganese, potasium-40 and radium-228 had more than 40% detections. A histogram for each analyte was prepared and is presented in Appendix D. Chromium, potasium-40 and radium-228 passed the WRS Test and were therefore not considered DL COCs. Manganese failed the WRS Test. However, analysis of the histogram clearly shows that the confirmation data set mirrors the background data distribution. Therefore, manganese was not considered a DL COC.

DL values calculated in Appendix D of the Work Plan for hexavalent chromium and Sr-90 were compared to the maximum detected concentration for each analyte. The most conservative DL value was selected for this comparison. Specifically, the background ground water concentration was used along with a high infiltration rate of 50%, and the depth was placed at 11-18 ft bgs. For hexavalent chromium, the DL was calculated as 1.2 mg/kg and the DL for Sr-90 was calculated as 17 pCi/g. The maximum detected concentrations for both analytes were below their respective DL's, and therefore the analytes were not considered DL COCs.

Several VOCs exceeded their respective detection limits and passed the first three DL evaluation steps. The WRS Test could not be performed for these VOCs since no background value was available for comparison. However, the detected VOCs (i.e., 2-butanone, acetone, ethylbenzene, toluene, and xylenes) were detected at relatively low concentrations and are readily biodegradable in the environment. The VOCs were also determined to be a non-issue for ground water impact for Scenario 2 of the Risk Screening Analysis. Therefore, VOCs do not appear to pose a potential threat to ground water and were not retained as DL COCs.

Two metals, molybdenum and zinc, and one radionuclide, Pb-210, could not be evaluated in Step 4 using either the WRS Test or the DL comparison. There were not enough results above the detection limits to conduct conclusive WRS Tests for these constituents, and no DL modeling had been generated. However, zinc was only detected in one of 63 samples above background at a concentration that is less than two times background. Pb-210 was only detected above background in two of 63 samples, at a maximum activity less than three times background. Given the analytic counting errors associated with Pb-210 results, these activities are representative of background. Molybdenum was detected at levels less than two times background. Therefore these three constituents do not appear to pose a threat to ground water degradation at the site. In addition, these constituents do not have primary MCLs. Therefore, none of these three constituents was considered a DL COC.

6.3.1.3 Results and Conclusion

Following the preliminary DL analysis, five analytes remained that required additional evaluation. These analytes, nitrate, mercury, carbon-14 (C-14), Cs-137, and tritium, are considered DL COCs. Each analyte is discussed in more detail below.

6.3.1.3.1 Nitrate

As discussed in Section 5, nitrate was detected above background in the Western Excavation area following completion of the RA. Additional nitrate delineation sampling was performed and the vertical and lateral extent of nitrate are presented in Section 5 and Figure 5-9. Nitrate concentrations decrease with increasing depth bgs with the maximum detected values noted at 10 to 15 ft bgs. Based on this investigation, the mass of nitrate in soil above the background level of 36 mg/kg was calculated to equal 950 pounds. The corresponding volume of soil was estimated at 4,000 cu yds.

Nitrate is a very soluble compound (K_d of 0.0 mL/g) and will migrate to the water table over time with infiltrating water. Ground water beneath the SWT Area has already been impacted from regional nitrate sources. Further evaluation was conducted to determine whether potential impact from the SWT Area nitrate is significant relative to the regional background nitrate. This evaluation is presented in Section 6.4.

6.3.1.3.2 Mercury

As discussed in Section 5, mercury was detected at the site above background levels. The spatial distribution study of mercury at the site indicates that mercury concentrations are higher in the shallow (zero-six ft bgs) zone than the deeper (> six ft bgs) zone (Figure 6-7). The source of mercury in soil at the SWT Area has not been identified. LEHR activities do not appear to be a source of mercury in soil due to the relatively uniform distribution of mercury in shallow soil and lack of hot spots across the site. One hypothesis is that during the 1920s and 1930s the land was used for agricultural and wastewater sludge disposal purposes, and that these activities have contributed to the incremental increase in mercury levels in shallow soil at the site. Fertilizer application and sludge land farming typically contain higher levels of mercury and can explain the higher levels of mercury at the SWT Area.

Recent evaluation of mercury speciation (WA, 2000) and refined DL analysis was conducted to help determine whether mercury requires further attention at the site. The results of these evaluations are presented in Section 6.4.

6.3.1.3.3 Carbon-14

C-14 was detected in 24 confirmation soil samples above the background level of 0.13 pCi/g. Note this level was the RDL for C-14 since this radionuclide was not detected in the background sampling. The majority of C-14 confirmation sample data results were within two times the RDL. However, in the southeast corner of the SWT Area, C-14 was detected in four samples in concentrations that are an order of magnitude greater than the RDL. Specifically, samples SSDTC024 through SSDTC028 contained C-14 ranging from 0.29 pCi/g to 5.84 pCi/g. These samples were collected at depths of 3-4 ft bgs. These samples are all located in an area that appears to be part of the UC Davis Trench Disposal Area instead of the SWT Area, based on the MOA, and therefore may not be DOE's responsibility.

The rate at which C-14 may reach ground water may depend on the C-14 speciation. However, C-14 speciation in the SWT Area is unknown. To better define the vertical concentration profile of this constituent, additional sampling was conducted at the locations of the two maximum detections (Figure 5-11). Samples were collected from ground surface to the water table and analyzed for C-14. Potentially contaminated depth interval and lithologic information from these borings was then used in the NUFT model to determine ground water protective DL values for comparison with all SWT Area C-14 results, as described in Section 6.4.

6.3.1.3.4 Cesium-137

Cs-137 was detected in eight confirmation samples above background at concentrations ranging from 0.012 to 1.18 pCi/g. As shown in Figure 6-8, six of the eight analytic results were close to the background value and are typical of values observed in surface soil at the Site that are a result of fallout from atmospheric nuclear testing. However, sample SSDTC036 contained Cs-137 at 1.18 pCi/g, which is an order of magnitude above the background level.

To better define the vertical concentration profile of this constituent, additional sampling was conducted at the locations of the two maximum Cs-137 activities (Figure 5-11). Samples were collected from ground surface to 30 ft bgs and analyzed for Cs-137. Potentially contaminated depth interval and lithologic information from these borings was then used in the NUFT model to determine ground water protective DL values for comparison with all SWT Area Cs-137 results, as described in Section 6.4.

6.3.1.3.5 Tritium

Tritium was detected in 12 confirmation samples above background in concentrations ranging from 1.21 to 5.2 pCi/g. To better define the vertical concentration profile of this constituent, additional sampling was conducted where the two maximum tritium activities were detected (Figure 5-11). Samples were collected from ground surface to 30 ft bgs and analyzed for tritium. Potentially contaminated depth interval and lithologic information from these borings was then used in the NUFT model to determine ground water protective DL values for comparison with all SWT Area tritium results, as described in Section 6.4.

6.4 Phase C—Refined Designated Level Analysis

This section summarizes the methodologies, assumptions, and rationale used in the refined DL modeling. The modeling tool used consists of a computer program written to interface with the multiphase fate and transport modeling code NUFT (Nitao, 1996). The details of the model, including the selection of input parameter values and model setup, are the same as those presented in previous reports (WA, 1997d; WA, 2000). Parameters are only discussed below if changes were made for this modeling effort. The iterative calculation approach as it applies to this tool is described in WA, 2000. Modeling input and results are included in Appendix F.

The scope of this modeling was limited to developing a soil profile model that was representative of the post-RA conditions in the SWT. One conservative infiltration rate was used. For nitrate and Cs-137, modeling was conducted using two different contamination intervals. For mercury, three different species were modeled.

6.4.1 Indicator Constituents and Distribution

Contamination depth intervals were selected based on the actual distribution of the five COCs as established by the post-RA confirmation sampling and follow-up DL sampling. For tritium and C-14, the contamination interval was conservatively assumed to extend from the surface to highest likely ground water level (estimated at 25 ft bgs). Concentrations of C-14 were above background in all DL samples collected at location DL-3. These data indicate the remaining C-14 source may be present throughout the vadose zone in the vicinity of DL-3.

Concentrations of tritium were above background in several confirmation samples from trench sidewalls and the excavation floor. In addition, ground water monitoring data indicate the presence of tritium as would be expected if tritium was present in aqueous form. Tritium, in the form of tritiated water, was expected to be distributed vertically throughout the vadose zone due to rapid migration with a velocity equal to that of infiltrating water. However, DL sampling results for two tritium hot spots did not indicate concentrations above background in any of the vertical profile samples. These data are not in agreement with the anticipated behavior of tritium in water. Yet, without evidence indicating that tritium in the Southwest Trenches exists in an immobile form, a homogeneous vertical distribution was assumed to be conservative.

For nitrate, two scenarios – one with the contamination interval extending from five to 20 ft bgs and the other extending from 10 to 21 ft bgs – were modeled. These two intervals were selected because the nitrate characterization results indicate two types of vertical nitrate distribution in the SWT Area. The first type of nitrate distribution is from the base of the RA excavation to the bottom of remaining nitrate source. The second type of nitrate distribution involves areas adjacent to the RA excavation where the remaining nitrate source begins approximately five ft bgs and ends approximately 20 ft bgs (Figure 5-10).

For Cs-137, two contamination intervals—one from three to seven ft bgs and one from ten to 12 ft bgs—were modeled. Concentrations of Cs-137 were above deep background (> four ft bgs) in a few confirmation soil samples located primarily in the floor of the excavations rather than the sidewalls. The results of designated level sampling indicated concentrations were below deep background in all samples collected at the two hot spot locations. These data, in addition to the soil/water partitioning coefficient (K_d), indicate Cs-137 is fairly immobile and likely distributed within a small vertical interval. Thus, two short vertical intervals were modeled based on the confirmation data. An interval of 10 to 12 ft bgs was selected to represent the Cs-137 detected at SSDTC063. The interval from five to eight ft bgs was selected to represent samples SSDTC032, 035, and 036.

For mercury, only one contamination interval (three to seven ft bgs) was used, but three different mercury species, including mercury sulfide, elemental mercury and methyl mercury, were modeled. The contaminated interval for mercury was selected based on the correlation between concentration and depth for confirmation samples (Figure 6-7). The correlation plot indicates mercury is above background within the selected interval.

To be conservative, each COC was assumed to be homogeneously distributed within the established contamination interval.

6.4.2 Soil Profile

An updated soil profile representing typical lithologies encountered in the post-RA SWT Area was developed based on lithologies encountered in the nitrate delineation boreholes, the six DL boreholes described in Section 5.9 above, and the RA trenches. As shown in Table 5-13, the subsurface lithology in the SWT Area generally is dominated by clayey and sandy silts to approximately 41 ft bgs, with more permeable silty sands from 41 to 50 ft bgs.

6.4.3 Ground Water Goals

The California and/or USEPA MCLs were used as the primary ground water goals in the DL modeling. For those COCs without an MCL (only methyl mercury), the USEPA PRG for tap water (USEPA, 2000) was used. In addition, estimated background concentrations were used as ground water goals. These background concentrations were based on COC concentrations detected in ground water from well UCD1-18, located approximately 500 ft up-gradient of the LEHR site. For mercury, C-14, Cs-137, and tritium, one-half of the lowest detection limits were used because these COCs have never been detected in well UCD1-18. For nitrate, the 80% lower confidence limit (LCL) on the 95^{th} quantile of concentrations detected in well UCD1-18 was used. This background nitrate concentration is 25 mg/L, higher than the 10 mg/L MCL.

6.4.4 Parameter Value Estimation

The assumptions and data used to develop the input parameters for modeling calculations are described in detail in WA, 1997d. In general, the same soil physical and hydraulic properties that were used previously to model the SWT Area were also used for this modeling effort. The physical, chemical and hydraulic input parameter values are summarized in Appendix F. Conservative assumptions regarding the selected parameters are described below:

- Depth to ground water: The smallest depth to the water table (20 ft) observed at the site was used in the model;
- Infiltration: An infiltration rate of 10.8 cm/year, corresponding to 25% of the mean annual precipitation rate (Dames and Moore, 1994), was selected. The infiltration was assigned to the model at constant rates resulting in continuous vertical flux towards the water table. This is a very conservative assumption since there are periods when the direction of flux is reversed due to evapotranspiration;
- Permeability and porosity: The highest measured values for each soil type are used in the model;
- Volatility: No volatilization was used for any of the COCs;
- Dispersion: No dispersion was used for any of the COCs;
- Partitioning coefficients: The smallest measured or reported partitioning coefficients were used for each soil type to minimize attenuation due to adsorption. The partitioning coefficient for all mercury species was assumed to be 52 mL/g, which is the lowest value found for mercury. This mercury K_d was from the Superfund Chemical Data Matrix (USEPA, 1996);
- Initial concentration distribution: ICs are assumed uniformly distributed throughout the entire extent of the selected interval thereby significantly overestimating the total mass for that interval; and,
- Dilution: A thin aquifer thickness at the bottom of the model was used to represent the top of the water table as a receptor. Dilution is therefore negligible and this assumption overestimates the concentrations of ICs that may reach the water table.

6.4.5 Model Setup, Initialization, and Parameter Sensitivity Analysis

The details of the conceptual model, boundary conditions and the initial flow conditions are described in WA, 1997d. The iterative modeling approach used to determine soil concentrations is described in WA, 2000.

The sensitivity of the SWT Area model to infiltration rate, lithology, dispersion, grid-cell spacing, initial contaminant mass inventory and distribution, and ground water goal was discussed in detail in WA, 1997 and WA, 2000. Although no formal sensitivity analysis was performed on retardation factor and vadose zone thickness, increasing these parameters would be expected to increase peak time and decrease peak concentration.

In summary, these sensitivity analyses suggest that the DL modeling performed for the SWT area produces conservatively low allowable soil concentrations for a given ground water goal because: 1) no vadose zone dispersion was included; 2) contaminant mass was estimated conservatively high; 3) retardation factors, especially for C-14 which was assumed to be in methanol form, were estimated conservatively low; and, 4) the vadose zone thickness used was the minimum recorded. The infiltration rate and lithologies used to represent the SWT area are considered representative, and using the most conservative reasonable representation of these parameters would not significantly change the modeling results. Therefore, the DL modeling results are expected to overestimate actual impacts to ground water.

6.5 Results and Conclusions

The results of the Refined DL Analysis are presented in Appendix F and summarized in Table 6-10, and are discussed by COC below.

6.5.1 Nitrate

The DL results indicate that nitrate levels of 1.7 mg/kg in the 5-to-20 ft bgs interval and 1.76 mg/kg in the 10-to-21 ft bgs interval may result in ground water impact equal to the 10 mg/L nitrate (as nitrogen) MCL (Table 6-10). These results are even lower than the preliminary DL analysis value of 10 mg/kg, primarily because the minimum depth-to-water was raised to 20 ft bgs for the refined modeling, resulting in a higher peak ground water concentration in a shorter time.

There are known regional nitrate impacts to ground water in the LEHR area, probably as a result of agricultural activities. For example, ground water from well UCD1-18 located approximately 500 ft upgradient of the LEHR site has a nitrate concentration of 25 mg/L (80% LCL on 95th quantile of available data). Using this concentration as a ground water goal for the DL modeling results in a soil concentration of 4.05 to 4.41 mg/kg.

To put into perspective the potential additional impact to ground water represented by nitrate above background in the SWT Area soil, the mass of this nitrate was calculated to be 950 pounds (see Section 6.3.1.3.1). The mass of nitrate in one acre of vadose zone (assumed to be 20 ft thick) at the average background concentration of 12.4 mg/kg is approximately 1,100 pounds (assuming a soil density of 1.7 g/ml). Agriculture in the UC Davis area discharges an estimated 17,000 pounds of nitrate (as nitrogen) per year to ground water, and the UC Davis outfall has historically discharged 36,500 pounds of nitrate as nitrogen per year to Putah Creek (Dames & Moore, 1990). Therefore, the potential impact to ground water from nitrate remaining in SWT soil is not significant compared to these regional nitrate impacts.

6.5.2 Mercury

Because the mercury in LEHR soil is known to be greater than 99% mercuric sulfide (WA, 2000), the DL modeling result for mercuric sulfide using the 11 µg/L MCL is the most appropriate for comparison with SWT Area soil data. As shown on Table 6-10 and in Appendix F, the DL modeling results indicate a soil mercuric sulfide concentration of 2.74 mg/kg could result in a peak ground water impact of 11 µg/L in approximately 5,000 years. The maximum mercury concentration detected in Southwest Trench confirmation samples was 6.1 mg/kg, which exceeds this model result, but the RME (95% UCL) concentration is 0.98 mg/kg, which is below the model result.

Table 6-10 also presents DL modeling results using background as a mercury ground water goal. Data from upgradient well UCD1-18 were used to represent the background concentration. Because mercury has not been detected in this well, one-half of the recent detection limit for mercury analyses (0.1 µg/L) was used as the ground water goal. As shown on Table 6-10, this ground water goal results in a modeled soil concentration of 0.026 mg/kg. This concentration is at least an order of magnitude lower than the background soil mercury concentration (which is not well-defined, but is at least 0.63 mg/kg).

Based on these DL modeling results, mercury in Southwest Trench soil does not appear to present a significant threat to ground water. The RME concentration might result in some measurable impact to ground water, but the peak concentration would be well below the 11 µg/L MCL and would occur in approximately 5,000 years.

6.5.3 Carbon-14

Using the 2,000 pCi/L MCL as the ground water goal, the DL modeling result for C-14 is 0.292 pCi/g in soil, with a peak ground water activity equivalent to the MCL in 10 years. Using the 3.5 pCi/L estimated background ground water concentration as a goal, the result is 0.0005 pCi/g. These results are approximately two times the LEHR background soil activity (0.13 pCi/g) and several orders of magnitude lower than soil background, respectively.

As discussed in Section 5.9, above-background C-14 soil activity may extend all the way to the water table (as assumed in the DL modeling) in only one isolated area near boring DL-3. As noted above, this boring appears to be located in the UC Davis Trench Disposal Area instead of the SWT Area, and therefore is probably not DOE's responsibility. Because C-14 soil activity in excess of background was detected at all depths down to the water table in this boring, it appears likely that C-14 in soil in this area has impacted, or will impact, ground water above background levels. Because C-14 soil activity in six of the nine samples from DL-3 also exceeded the 0.292 pCi/g modeling result, local ground water impact may also exceed the MCL. However, because these above-background C-14 activities appear to represent a very small area and the DL modeling is very conservative, this potential ground water impact is likely insignificant. This is demonstrated by the C-14 activity measured in ground water from well UCD1-23, the closest well downgradient of the DL boring, which was approximately an order of magnitude less than the 2,000 pCi/L MCL in samples collected prior to the RA in 1998. Since the RA in 1998, C-14 activities in this well have decreased to below the 20 pCi/L detection limit.

6.5.4 Cesium-137

The DL modeling results for Cs-137 indicate that its presence in Southwest Trenches soil presents no significant risk to ground water. Even a ground water goal a million times less that the 20 pCi/L MCL results in an allowable soil concentration of at least 1.27×10^6 pCi/g (Appendix F). Using the estimated background activity of 1 pCi/L as a ground water goal results in an allowable soil concentration of at least 7.04×10^9 pCi/g. The maximum Cs-137 activity detected in Southwest Trench confirmation sampling and DL borings was 1.18 pCi/g. Therefore, based on these results Cs-137 in Southwest Trenches soil presents no threat to ground water.

6.5.5 Tritium

The DL modeling results for tritium indicate that a soil activity of 3.51 pCi/g distributed throughout the vadose zone may result in ground water impact at the 20,000 pCi/L MCL. Based on the DL modeling, a soil activity of 0.02 pCi/g distributed throughout the vadose zone might result in ground water impact at the estimated 110 pCi/L background level. However, the LEHR area background tritium activity for soil is 1.2 pCi/g, significantly higher than this modeling result.

The maximum tritium activity detected in Southwest Trenches confirmation soil samples was 5.2 pCi/g, and the RME activity was 0.76 pCi/g. The tritium activities detected in all soil samples from the two DL borings were lower than both the LEHR background level and this RME activity. Based on these results, it appears that tritium in SWT Area soil would have very limited impact on ground water beyond that due to background soil, and that any impact would be well below the 20,000 pCi/L MCL.

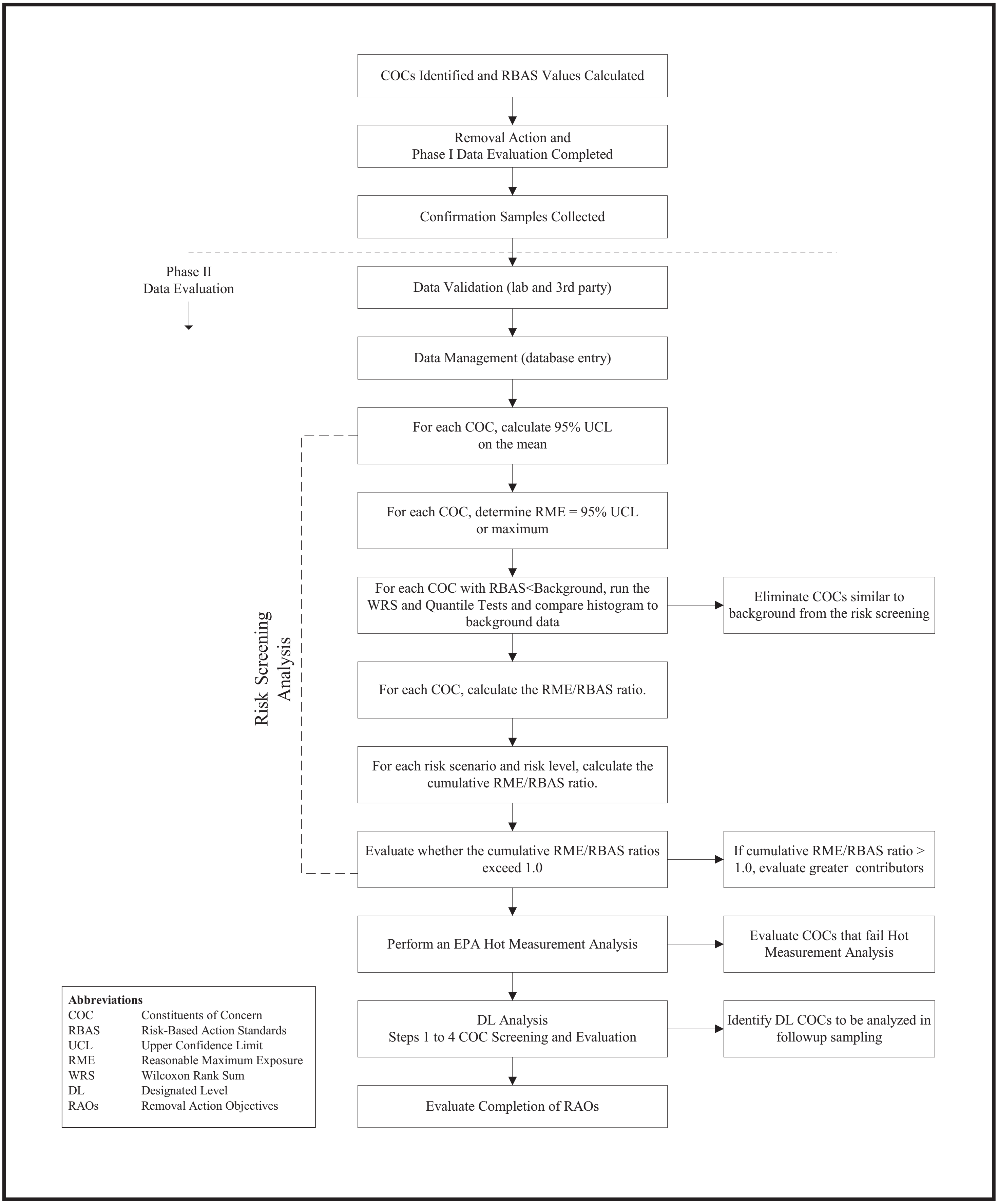


Figure 6-1. Data Evaluation Process, LEHR Southwest Trenches Area Removal Action

Weiss Associates

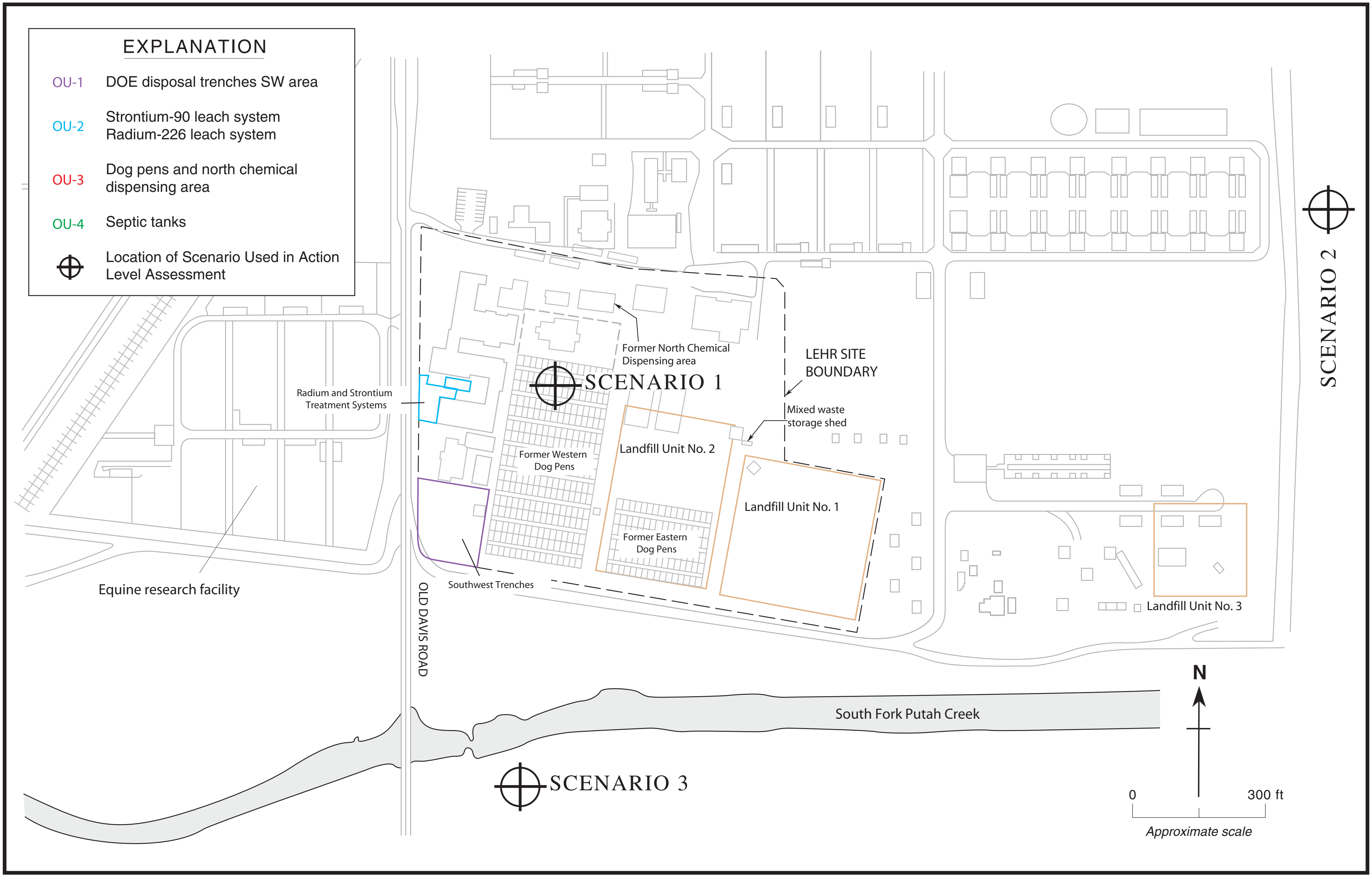


Figure 6-2. Locations of Receptors for Scenarios 1,2, and 3, LEHR Facility, Davis, California

Weiss Associates

L295-010.ai

06/21/01

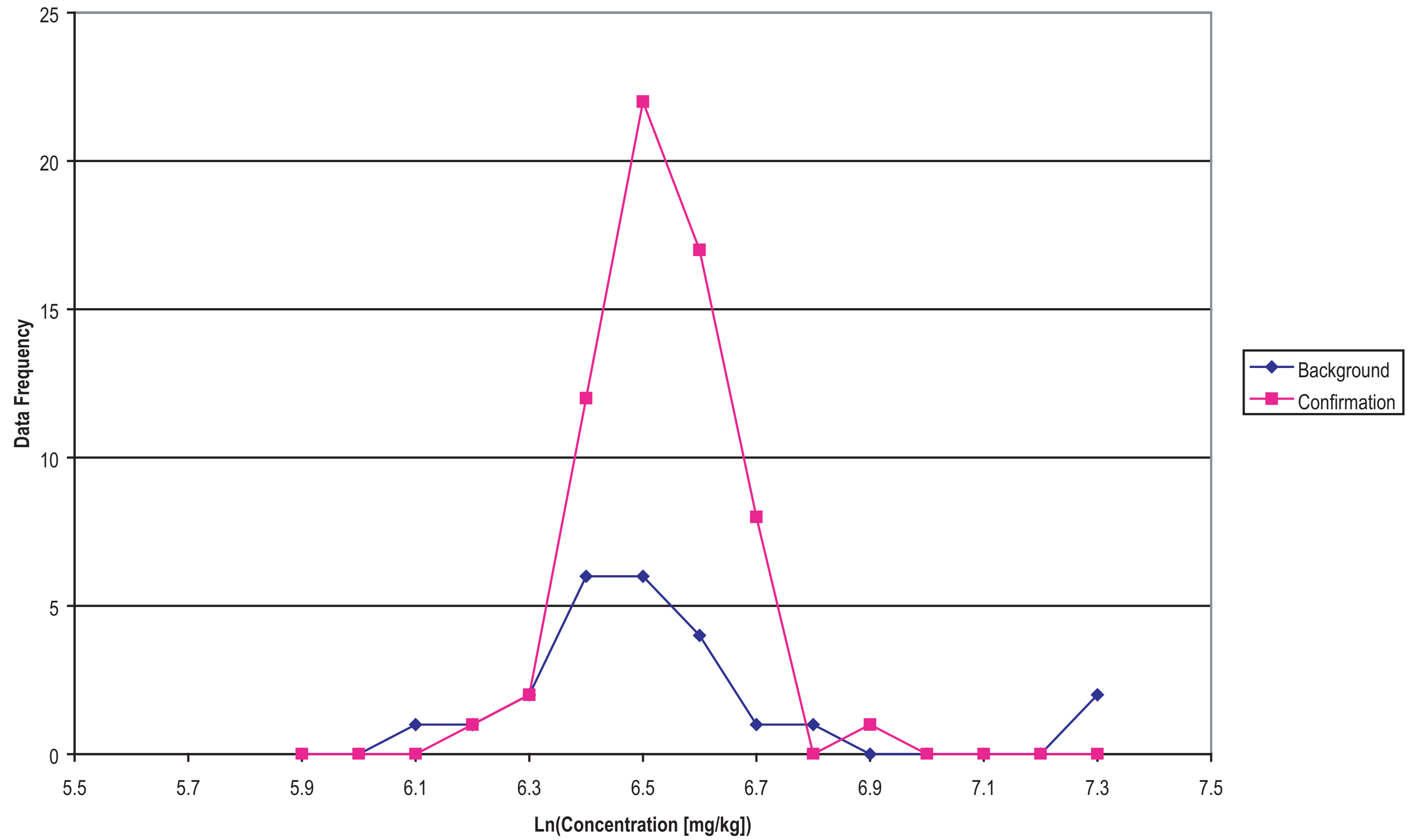


Figure 6-3. Histograms of Log Transformed Background Data and Southwest Trenches Confirmation Data for Manganese LEHR Southwest Trenches Area Removal Action

Weiss Associates

4002-057.ai

6/13/01

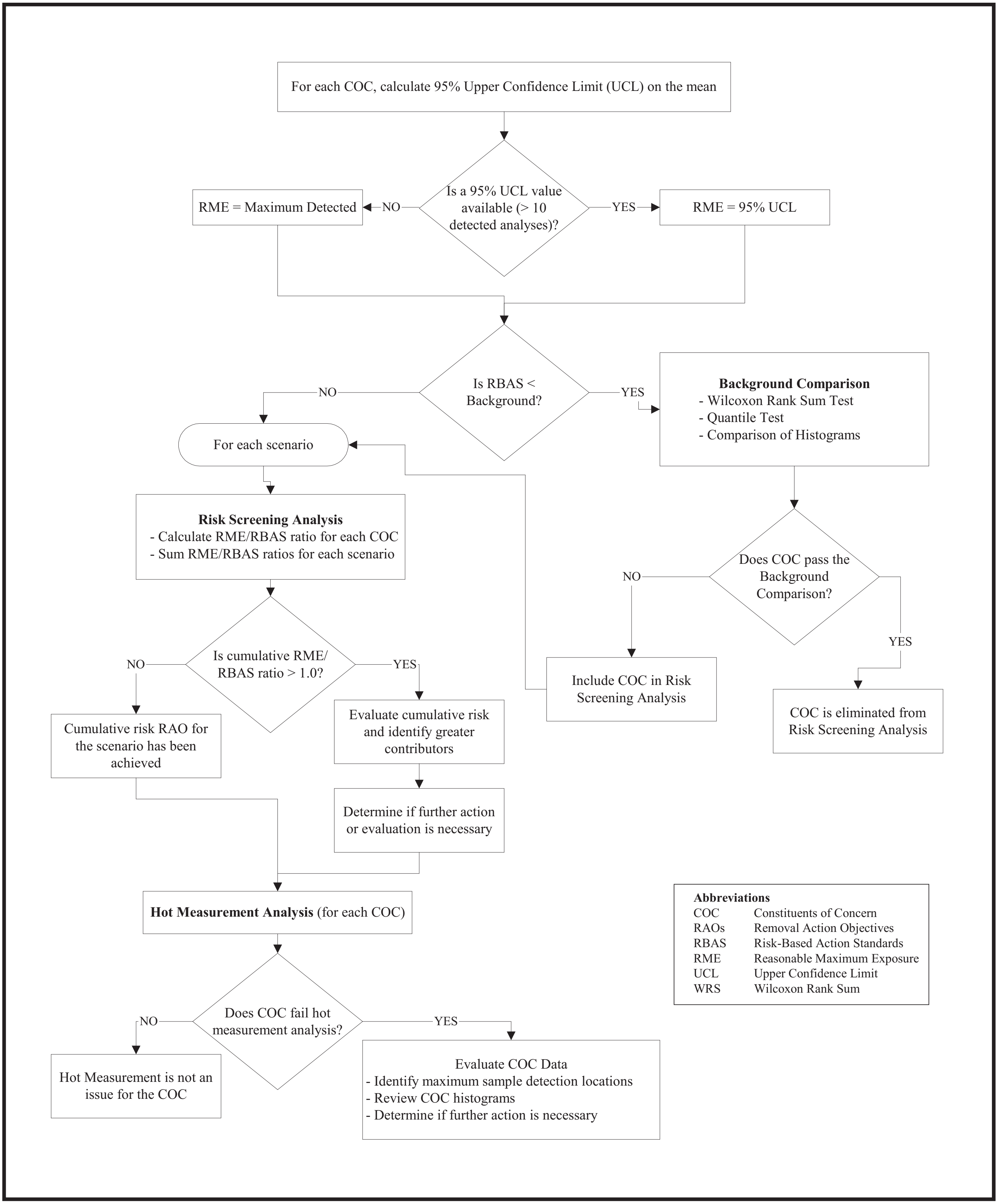


Figure 6-4. Risk Screening Analysis Decision Flow Chart
LEHR Southwest Trenches Area Removal Action

Weiss Associates

4002-054.ai

6/13/01

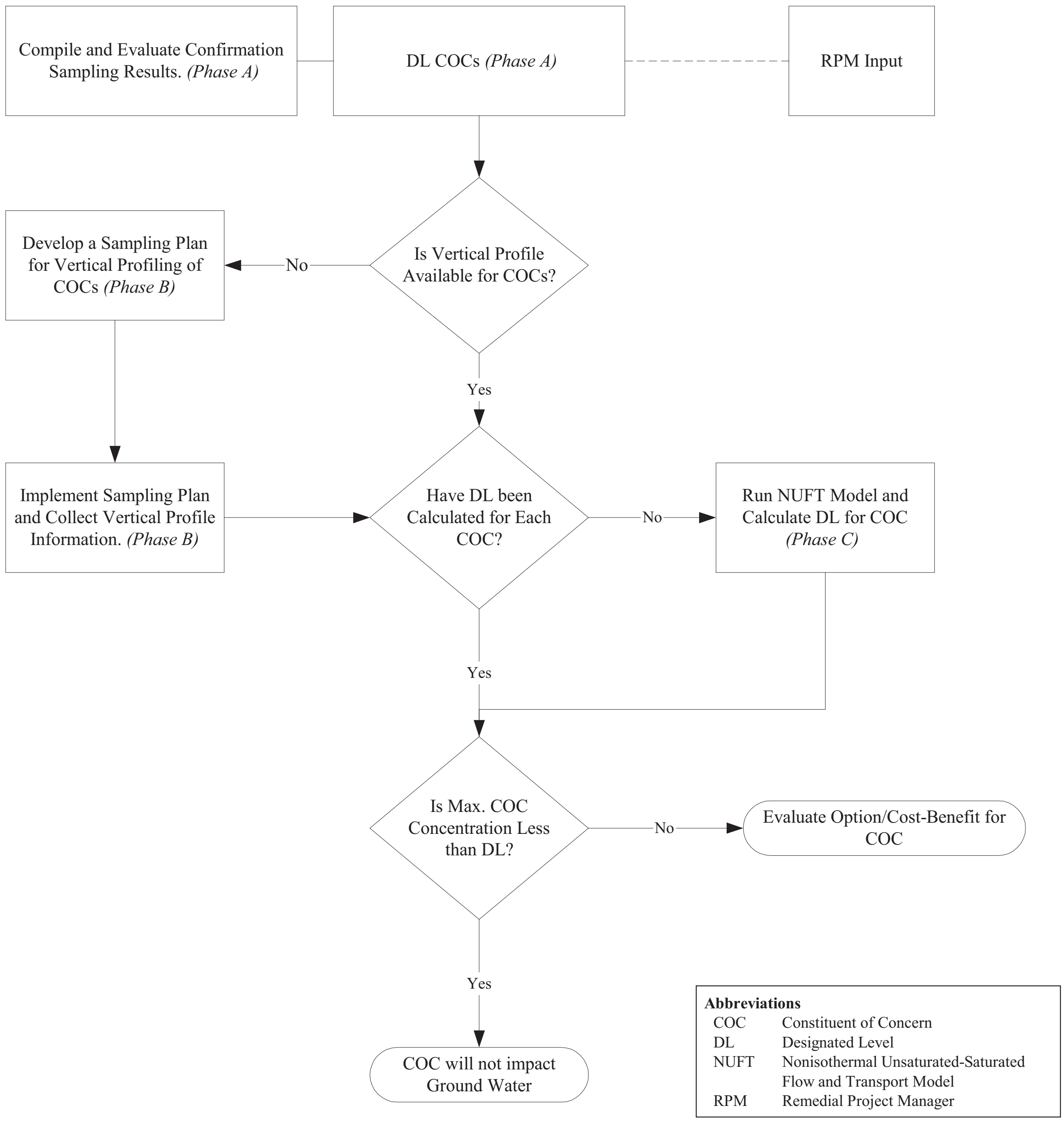


Figure 6-5. Designated Level Analysis Decision Flow Diagram
LEHR Southwest Trenches Area Removal Action

Weiss Associates

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6/13/01

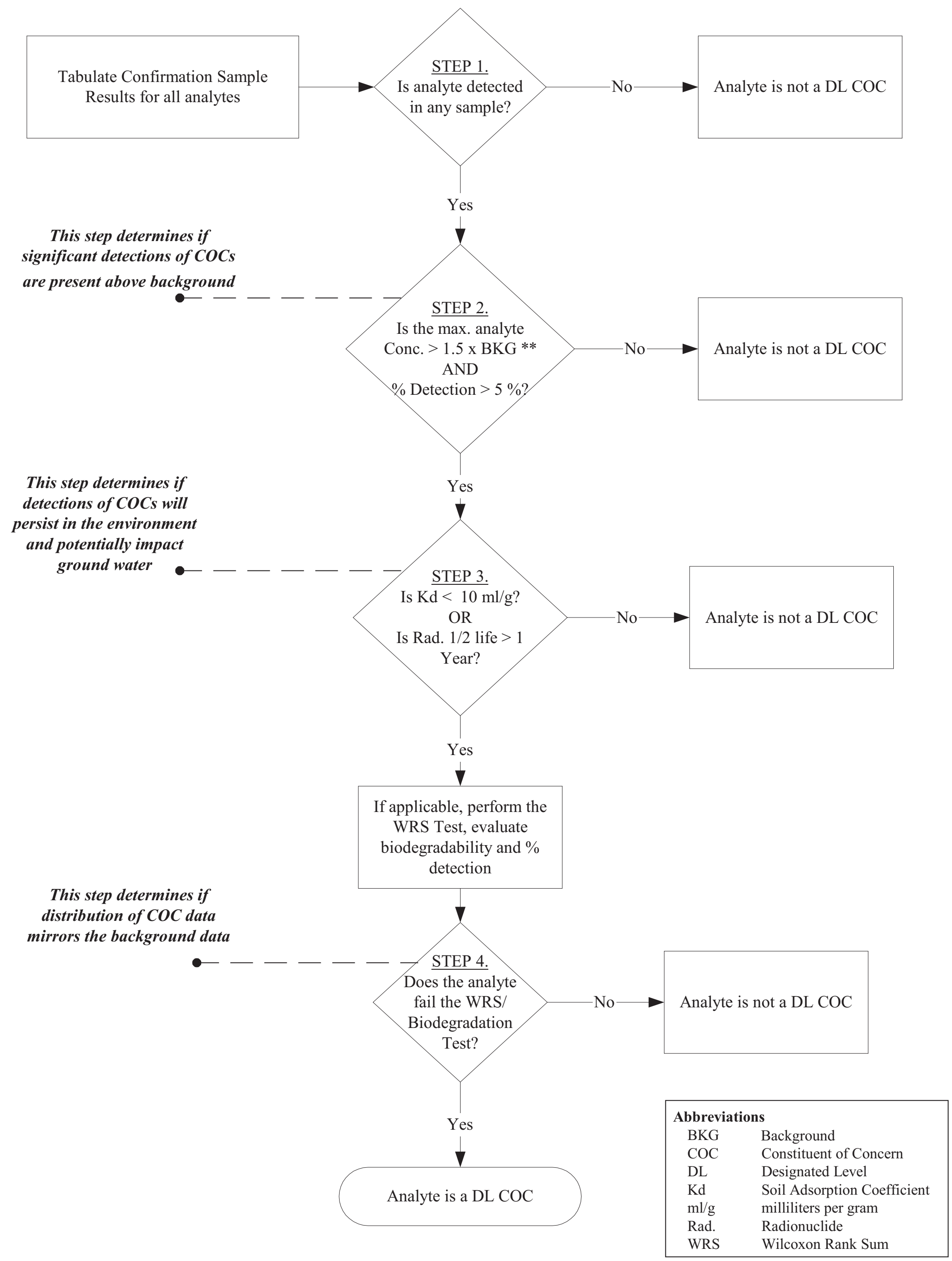

Figure 6-6. Preliminary Designated Level Analysis Flowchart Data Evaluation and Screening LEHR Southwest Trenches Area Removal Action

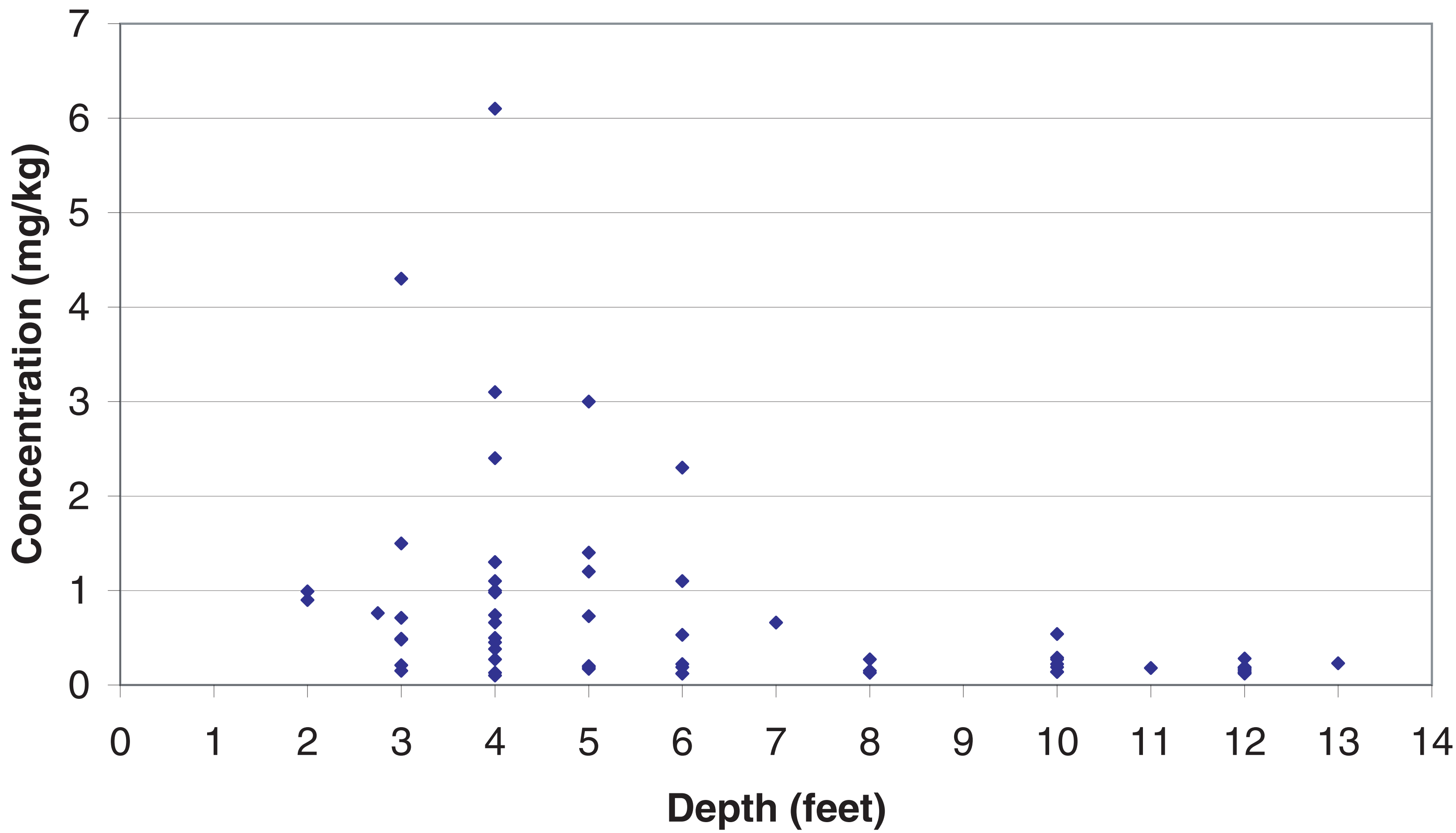

Figure 6-7. Correlation Plot, Concentration and Depth, Mercury in Southwest Trenches Confirmation Samples

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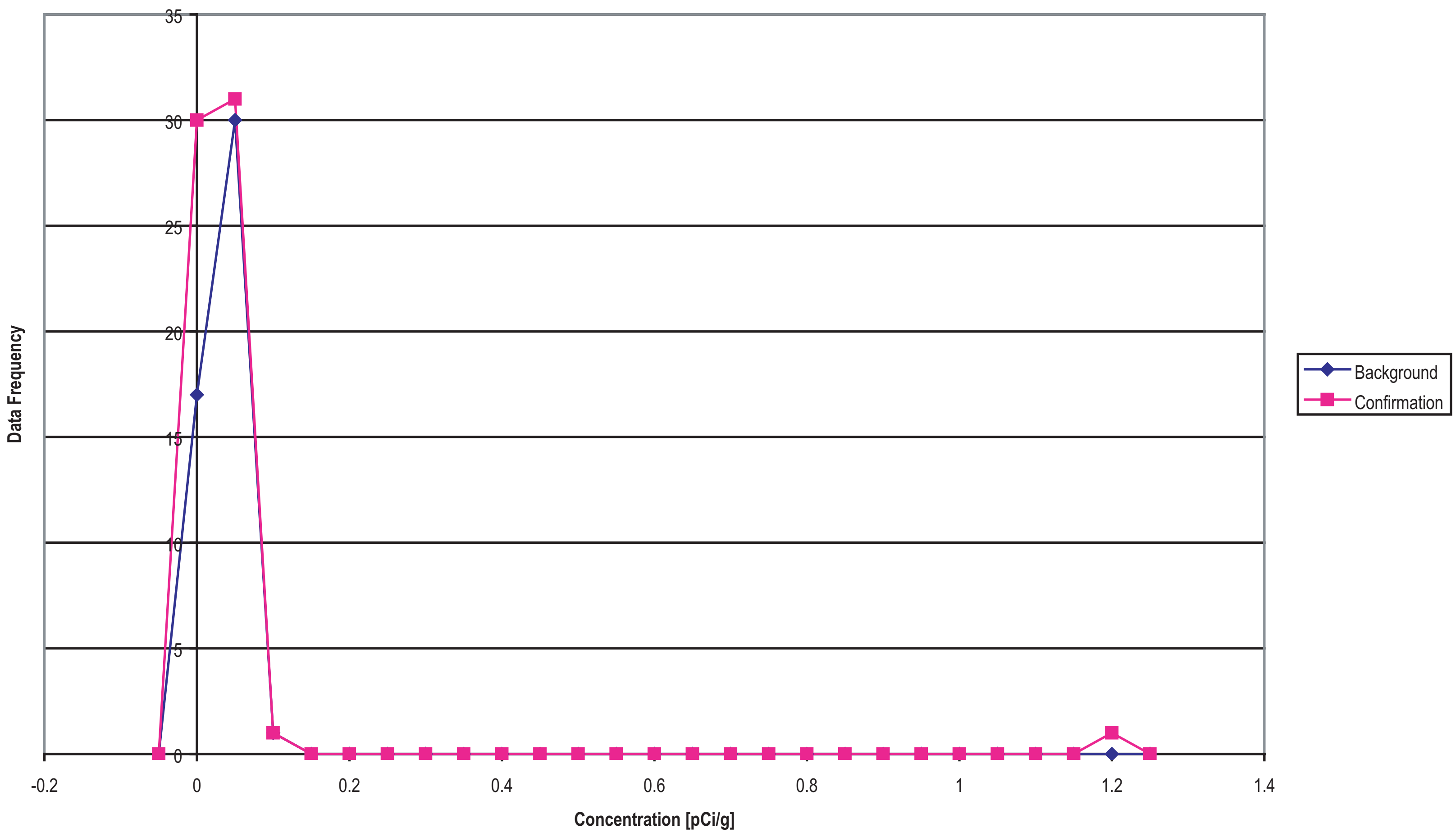

Weiss Associates

Figure 6-8. Histograms of Background Data and Southwest Trenches Confirmation Data for Cesium-137
LEHR Southwest Trenches Area Removal Action

4002-059.ai

6/13/01

Table 6-1. Summary of Risk-Based Action Standards for Carcinogenic Compounds in Surface Soil at the 10^{-6} Risk Level, DOE LEHR, UC Davis, California

		Risk-Based Action Standards			
Analyte	**Background Concentration (mg/kg)[1]**	**Scenario 1 10^{-6} Risk (mg/kg)**	**Scenario 2 10^{-6} Risk (mg/kg)**	**Scenario 3 10^{-6} Risk (mg/kg)**	**1998 PRG Residential 10^{-6} risk (mg/kg)**
4,4'-DDD	None	7.9	9.4	70,000	2.4
4,4'-DDE	None	5.6	9.0	61,000	1.7
4,4'-DDT	None	5.6	30	23,000	1.7
Alpha-BHC	None	0.30	0.0075	8,400	0.086
Alpha-Chlordane	None	1.5	0.80	5.9	1.6 total
Arochlor-1260	None	0.25	4.9	120	0.2
Benzene	None	0.23	0.015	NC	0.62
Benzo(a)anthracene	None	2.6	1.2	30,000	0.56
Benzo(a)pyrene	None	0.26	0.24	1,300	0.056
Benzo(b)fluoranthene	None	2.6	3.3	12,000	0.56
Benzo(k)fluoranthene	None	26	27	100,000[2]	5.6
Bis(2-Ethylhexyl)phthalate	None	136	7.7	8.6	32
Cadmium (Cd)	0.46	4,800	100,000[2]	100,000[2]	9.0
Carbazole	None	95	2.2	100,000[2]	22
Carbon Tetrachloride	None	0.22	0.055	NC	0.23
Chlordane	**None**	**1.5**	**0.78**	**5.9**	**1.6 total**
Chromium (Cr)	181	720	100,000[2]	100,000[2]	210
Chromium, Hexavalent (Cr+6)	**0.054**	**100**	**100,000[2]**	**23,000**	**0.2**
Chrysene	None	260	20	100,000[2]	6.1
Delta-BHC	None	0.30	0.013	0.21	0.30
Dibenzo(a,h)anthracene	None	0.26	0.54	260	0.056
Dieldrin	None	0.12	0.015	4,100	0.028
Formaldehyde	None	220	NC	NC	8200
Gamma-BHC	None	1.5	0.030	35,000	0.42
Gamma-Chlordane	None	1.5	0.81	6.4	1.6 total
Heptachlor	None	0.42	0.17	14,000	0.099
Heptachlor Epoxide	None	0.21	0.00057	1,800	0.049
Indeno(1,2,3-cd)pyrene	None	2.6	4.9	4,600	0.56
Lead (Pb)	9.5	3.0	0.044	19	130
Mercury (Hg)	**0.63**	**16,000**	**15**	**540**	**22**
Methylene Chloride	None	7.2	0.13	NC	8.5
Pentachlorophenol	None	16	13	100,000[2]	2.5

Table 6-1. Summary of Risk-Based Action Standards for Carcinogenic Compounds in Surface Soil at the 10^{-6} Risk Level, DOE LEHR, UC Davis, CA (continued)

		Risk-Based Action Standards			
Analyte	**Background Concentration (pCi/g)**[1]	**Scenario 1 10^{-6} Risk (pCi/g)**	**Scenario 2 10^{-6} Risk (pCi/g)**	**Scenario 3 10^{-6} Risk (pCi/g)**	**1998 PRG Residential 10^{-6} risk (pCi/g)**
Radionuclides					
Americium-241	<0.014	17	0.092	16,000	1.9
Bismuth-212 (Th-228 Daughter)	0.43	DP	DP	DP	DP
Bismuth-214 (Ra-226 Daughter)	0.54	DP	DP	DP	DP
Carbon-14	<0.13	4,200	9,500	7,000	770
Cesium-137+D	0.012	0.10	200,000	25,000	0.020
Cobalt-60	<0.006	0.022	32,000	5,800	0.0043
Lead-210+D	1.6	9.6	40	40	0.78
Lead-214 (Ra-226 Daughter)	0.58	DP	DP	DP	DP
Plutonium-241 +D	<0.50	600	3.2	2,200,000	150
Radium-223 (U-235 Daughter)	DP	DP	DP	DP	DP
Radium-226+D	**0.75**	**0.0042**	**1,100**	**1,100**	**0.0062**
Strontium-90+D	**0.056**	**10**	**290,000**	**34,000**	**14**
Thorium-228+D	0.74	0.032	2,000	1,600	0.041
Thorium-232	0.75	0.022	3,800	2,200	24
Thorium-234 (U-238+D)	0.78	3.2	88,000	63,000	0.69
Tritium	<1.2	130,000	5.4	2,500,000	11,000
Uranium-235+D	0.039	0.79	0.15	32,000	0.16

Notes
[1] Background concentration calculations are presented in Appendix C of the Work Plan.
[2] Risk not exceeded for free-phase interstitial compound. Assumes 10% by weight (i.e., 100,000 mg/kg) as the maximum soil concentration.
None = Analyte is not present in background soil samples.
NC = Exposure pathway incomplete for compound.
DP = Daughter product; standard driven by parent isotope.
Scenario 1 - On-Site Researcher, Scenario 2 - East-Side Residential Farmer, and Scenario 3 - South-Side Residential Farmer
Highlighted and blocked compounds are the Removal Action “Driver” compounds.

Table 6-2. Summary of Risk-Based Action Standards for Non-Carcinogenic Compounds in Surface Soil at a Hazard Index of 1.0, DOE LEHR Site

		Risk-Based Action Standards			
Analyte	**Background Concentration (mg/kg)[1]**	**Scenario 1 (mg/kg)**	**Scenario 2 (mg/kg)**	**Scenario 3 (mg/kg)**	**1998 PRG Residential HQ = 1.0 risk (mg/kg)**
2-ButaNone (MEK)	None	710	12	NC	6,900
Acenaphthene	None	41,000	250	100,000[2]	2,600
Acetone	None	830	1.7	1,900	1,400
Anthracene	None	200,000	1,400	100,000[2]	14,000
Antimony (Sb)	1.4	680	0.30	100,000[2]	30
Barium (Ba)	260	100,000[2]	53	100,000[2]	5,200
Benzo(g,h,i)perylene	None	20,000	9,100	100,000[2]	N/A
Cadmium (Cd)	0.51	850	0.38	100,000[2]	9
Chromium (Cr)	181	100,000[2]	760	100,000[2]	210
Chromium, Hexavalent (Cr+6)	**0.054**	**8,500**	**3.8**	**740**	**0.2**
Copper (Cu)	60	63,000	28	100,000[2]	2,800
Dibenzofuran	None	2,700	14	100,000[2]	210
Diethyl Phthalate	None	100,000[2]	220	100,000[2]	44,000
Di-n-Butylphthalate	None	68,000	890	3,300	5,500
Di-n-Octylphthalate	None	14,000	28,000	4,900	1,100
Endosulfan I	None	4,100	29	100,000[2]	330
Endosulfan Sulfate	None	4,100	26	100,000[2]	2,600
Ethyl Benzene	None	2,400	10	NC	230
Fluoranthene	None	27,000	1,800	100,000[2]	2,000
Fluorene	None	27,000	170	100,000[2]	18,000
Formaldehyde	None	100,000	1.7	10,000	8,200
Manganese (Mn)	750	52,000	36	100,000[2]	3,100
Mercury (Hg)	**0.63**	**510**	**3.1[3]**	**6.4**	**22**
Methoxychlor	None	3,400	100	100,000[2]	270
Naphthalene	None	27,000	39	100,000[2]	55
Phenanthrene	None	20,000	1,200	100,000[2]	N/A
Pyrene	None	20,000	490	100,000[2]	1,500
Selenium (Se)	1.2	8,500	58	100,000[2]	370
Silver (Ag)	0.55	8,500	3.8	100,000[2]	370
Styrene	None	710	76	NC	1,700
Toluene	None	920	19	NC	520
Xylenes (Total)	None	1,700	700	NC	210
Zinc (Zn)	87	100,000[2]	3,400	100,000[2]	22,000

Table 6-2. Summary of Risk-Based Action Standards for Non-Carcinogenic Compounds in Surface Soil at a Hazard Index of 1.0, DOE LEHR Site (continued)

Notes

[1] Background concentration calculations are presented in Appendix C of the Work Plan.

[2] Risk not exceeded for free-phase interstitial compound. Assumes 10% by weight (i.e., 100,000 mg/kg) as the maximum soil concentration.

3 RBAS recalculated in 2001 using site-specific lithology and mercury species data.

None = Analyte is not present in background soil samples.

RES = HI not exceeded for pure compound.

Scenario 1 - On-Site Researcher, Scenario 2 - East-Side Residential Farmer, and Scenario 3 - South-Side Residential Farmer

Highlighted and blocked compounds are the Removal Action “Driver” compounds.

Abbreviations

HQ Hazard Quotient
mg/kg milligrams per kilogram
N/A not applicable
NC not calculated

Table 6-3. Background Comparison of Confirmation Samples for Constituents of Concern with Risk-Based Action Standard Values Less than Background Concentrations, LEHR Southwest Trenches Area Removal Action, UC Davis, California

COC[1]	WRS Test	Quantile Test
Antimony	% ND > 40%[2]	Pass
Barium	Pass	Pass
Copper	Pass	Pass
Lead	Pass	Pass
Manganese	Fail[3]	Pass
Radium-226	Pass	Pass
Thorium-228	Pass	Pass
Thorium-232	Pass	Pass

Notes

(1) The following COCs did not have RBAS values since they are daughter products to other radioactive COCs with half-lives on the order of minutes or days and therefore were not tested for background comparison:

Bismuth-212 - Thorium-228 Daughter Product
Bismuth-214 - Radium-226 Daughter Product
Lead-214 - Radium-226 Daughter Product

(2) The USEPA guidance (USEPA, 1994) states the WRS Test should be avoided if more than 40% of the analytical results are less than the detection limit for either the background or cleanup area data sets.

(3) The WRS Test calculates a WRS Test statistic known as the Z_{rs} value, based on the error parameters discussed with and approved by USEPA. If the calculated Z_{rs} value is less than the acceptable $Z_{1-\alpha}$ value from a look-up table, then the COC fails. In the case of Manganese, it marginally failed the WRS Test with a calculated Z_{rs} value of 1.28 vs. the acceptable $Z_{1-\alpha}$ value of 1.43.

Table 6-4. Screening Analysis for Risk Constituents of Concern, LEHR Southwest Trenches Area Removal Action

Constituent	Units	Number of Samples > Detection Limit[1]	Number of Detections > Background	Background Concentration	Maximum Detected Concentration	95% UCL	RME[2]	Carc. RBAS Scenario 1	Carc. RBAS Scenario 2	Carc. RBAS Scenario 3	Non-Carc. RBAS Scenario 1	Non-Carc. RBAS Scenario 2	Non-Carc. RBAS Scenario 3	**Carc. Scen. 1 RME/RBAS Ratio**	**Carc. Scen. 2 RME/RBAS Ratio**	**Carc. Scen. 3 RME/RBAS Ratio**	**Non-Carc. Scen. 1 RME/RBAS Ratio**	**Non-Carc. Scen. 2 RME/RBAS Ratio**	**Non-Carc. Scen. 3 RME/RBAS Ratio**	**Carc. RME/ Residential PRG Ratio**	**Non-Carc. RME/ Residential PRG Ratio**
Chromium, Hexavalent	mg/kg	42	42	0.05	1.06	0.42	0.42	100.00	120,000.00	23,000.00	8,500.0	3.8	740.0	0.00	0.00	0.00	0.00	0.11	0.00	2.11	n/a
Metals																					
Antimony	mg/kg	19	1	1.40	1.50	1.16	1.16	n/a	n/a	n/a	680.0	0.3	100,000.0	n/a	n/a	n/a	*	*	*	n/a	0.04
Barium	mg/kg	63	1	260.00	286.00	191.33	191.33	n/a	n/a	n/a	110,000.0	53.0	100,000.0	n/a	n/a	n/a	*	*	*	n/a	0.04
Cadmium	mg/kg	0	0	0.51	n/a	n/a	n/a	n/a	n/a	n/a	850.0	0.4	100,000.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chromium	mg/kg	63	7	181.00	314.00	146.88	146.88	720.00	100,000.00	100,000.00	100,000.0	760.0	100,000.0	0.20	0.00	0.00	0.00	0.19	0.00	0.70	n/a
Copper	mg/kg	63	0	60.00	51.50	41.44	41.44	63,000.00	28.00	610,000.00	n/a	n/a	n/a	*	*	*	n/a	n/a	n/a	n/a	0.01
Lead	mg/kg	63	1	9.50	10.30	7.56	7.56	3.00	0.04	19.00	n/a	n/a	n/a	*	*	*	n/a	n/a	n/a	0.06	n/a
Manganese	mg/kg	63	6	750.00	968.00	669.20	669.20	n/a	n/a	n/a	52,000.0	36.0	100,000.0	n/a	n/a	n/a	0.01	*	0.01	n/a	0.22
Mercury	mg/kg	63	23	0.63	6.10	0.98	0.98	16,000.00	15.00	540.00	510.0	3.1	6.4	0.00	0.07	0.00	0.00	0.32	0.15	n/a	0.04
Selenium	mg/kg	19	3	1.20	1.60	1.02	1.02	n/a	n/a	n/a	8,500.0	58.0	100,000.0	n/a	n/a	n/a	0.00	0.02	0.00	n/a	0.00
Silver	mg/kg	9	2	0.55	0.75	n/a	0.75	n/a	n/a	n/a	8,500.0	3.8	100,000.0	n/a	n/a	n/a	0.00	0.20	0.00	n/a	0.00
Zinc	mg/kg	63	1	87.00	150.00	76.58	76.58	n/a	n/a	n/a	510,000.0	3,400.0	150,000.0	n/a	n/a	n/a	0.00	0.02	0.00	n/a	0.00
Pesticides/PCBs																					
4,4'-DDD	ug/kg	6	6	0.00	11.50	n/a	11.50	7,900.00	9,400.00	70,000,000.00	n/a	n/a	n/a	0.00	0.00	0.00	n/a	n/a	n/a	0.00	n/a
4,4'-DDE	ug/kg	28	28	0.00	26.80	5.70	5.70	5,600.00	9,000.00	61,000,000.00	n/a	n/a	n/a	0.00	0.00	0.00	n/a	n/a	n/a	0.00	n/a
4,4'-DDT	ug/kg	6	6	0.00	276.00	n/a	276.00	5,600.00	30,000.00	23,000,000.00	n/a	n/a	n/a	0.05	0.01	0.00	n/a	n/a	n/a	0.16	n/a
alpha-BHC	ug/kg	0	0	0.00	n/a	n/a	n/a	300.00	7.50	8,400,000.00	n/a	n/a	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
alpha-Chlordane	ug/kg	44	44	0.00	110.00	13.96	13.96	1,500.00	800.00	5,900.00	n/a	n/a	n/a	0.01	0.02	0.00	n/a	n/a	n/a	0.01	n/a
Chlordane	ug/kg	1	1	0.00	n/a	n/a	53.48	1,500.00	780.00	5,900.00	n/a	n/a	n/a	0.04	0.07	0.01	n/a	n/a	n/a	0.03	n/a
delta-BHC	ug/kg	1	1	0.00	0.12	n/a	0.12	300.00	13.00	210.00	n/a	n/a	n/a	0.00	0.01	0.00	n/a	n/a	n/a	0.00	n/a
Dieldrin	ug/kg	1	1	0.00	0.63	n/a	0.63	120.00	15.00	4,100,000.00	n/a	n/a	n/a	0.01	0.04	0.00	n/a	n/a	n/a	0.02	n/a
Endosulfan I	ug/kg	0	0	0.00	n/a	n/a	n/a	n/a	n/a	n/a	4,100,000.0	29,000.0	100,000,000.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Endosulfan Sulfate	ug/kg	1	1	0.00	0.09	n/a	0.09	n/a	n/a	n/a	4,100,000.0	26,000.0	100,000,000.0	n/a	n/a	n/a	0.00	0.00	0.00	n/a	0.00
Gamma-BHC	ug/kg	0	0	0.00	n/a	n/a	n/a	30.00	35,000,000.00	420.00	n/a	n/a	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
gamma-Chlordane	ug/kg	44	44	0.00	94.80	12.78	12.78	105,000.00	810.00	6,400.00	n/a	n/a	n/a	0.00	0.02	0.00	n/a	n/a	n/a	0.03	n/a
Heptachlor	ug/kg	12	12	0.00	16.70	5.26	5.26	420.00	170.00	14,000,000.00	n/a	n/a	n/a	0.01	0.03	0.00	n/a	n/a	n/a	0.05	n/a
Heptachlor Epoxide	ug/kg	0	0	0.00	n/a	n/a	n/a	0.57	1,800,000.00	49.00	n/a	n/a	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Methoxychlor	ug/kg	0	0	0.00	n/a	n/a	n/a	n/a	n/a	n/a	3,400,000.0	100,000.0	100,000,000.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PCB-1260 (Arochlor)	ug/kg	1	1	0.00	9.70	n/a	9.70	250.00	4,900.00	120,000.00	n/a	n/a	n/a	0.04	0.00	0.00	n/a	n/a	n/a	0.05	n/a
																					n/a
Radionuclides																					n/a
Americium-241	pCi/g	5	3	0.01	1.61	0.07	0.07	17.00	0.09	16,000.00	n/a	n/a	n/a	0.00	0.78	0.00	n/a	n/a	n/a	0.04	n/a
Bismuth-212	pCi/g	61	24	0.43	0.76	0.43	0.43	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bismuth-214	pCi/g	57	16	0.54	0.64	0.49	0.49	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Carbon-14	pCi/g	26	24	0.13	5.84	0.54	0.54	4,200.00	9,500.00	7,000.00	n/a	n/a	n/a	0.00	0.00	0.00	n/a	n/a	n/a	0.00	n/a
Cesium-137	pCi/g	8	8	0.01	1.18	0.05	0.05	0.10	200,000.00	25,000.00	n/a	n/a	n/a	0.54	0.00	0.00	n/a	n/a	n/a	2.72	n/a
Cobalt-60	pCi/g	0	0	0.01	n/a	0.01	0.01	0.02	32,000.00	5,800.00	n/a	n/a	n/a	0.00	0.00	0.00	0.00	0.00	0.00	1.21	n/a
Lead-210	pCi/g	7	2	1.60	4.43	1.55	1.55	9.60	40.00	40.00	n/a	n/a	n/a	0.16	0.04	0.04	n/a	n/a	n/a	1.99	n/a
Lead-214	pCi/g	63	37	0.58	0.77	0.61	0.61	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Plutonium-241	pCi/g	7	1	0.50	0.52	0.14	0.14	600.00	3.20	2,200,000.00	n/a	n/a	n/a	0.00	0.04	0.00	n/a	n/a	n/a	0.00	n/a
Radium-223	pCi/g	0	0	n/a	n/a	0.03	0.03	n/a	n/a	n/a	n/a	n/a	n/a	0.00	0.00	0.00	0.00	0.00	0.00	n/a	n/a
Radium-226	pCi/g	63	1	0.75	0.76	0.58	0.58	0.00	1,100.00	1,100.00	n/a	n/a	n/a	*	*	Note 1	n/a	n/a	n/a	n/a (bkgrd)	n/a
Strontium-90	pCi/g	24	21	0.06	7.91	0.64	0.64	10.00	290,000.00	34,000.00	n/a	n/a	n/a	0.06	0.00	0.00	n/a	n/a	n/a	0.05	n/a
Thorium-228	pCi/g	63	5	0.74	0.89	0.57	0.57	0.03	2,000.00	1,600.00	n/a	n/a	n/a	*	*	Note 1	n/a	n/a	n/a	n/a (bkgrd)	n/a
Thorium-232	pCi/g	64	0	0.75	0.73	0.48	0.48	0.02	3,800.00	2,200.00	n/a	n/a	n/a	*	*	Note 1	n/a	n/a	n/a	0.02	n/a
Thorium-234	pCi/g	29	19	0.78	3.74	0.86	0.86	3.20	88,000.00	63,000.00	n/a	n/a	n/a	0.27	0.00	0.00	n/a	n/a	n/a	1.25	n/a
Tritium	pCi/g	12	11	1.20	5.20	0.76	0.76	130,000.00	5.40	2,500,000.00	n/a	n/a	n/a	0.00	0.14	0.00	n/a	n/a	n/a	0.00	n/a
Uranium-235	pCi/g	50	3	0.04	0.06	0.03	0.03	0.79	0.15	32,000.00	n/a	n/a	n/a	0.03	0.17	0.00	n/a	n/a	n/a	0.16	n/a

Table 6-4. Screening Analysis for Risk Constituents of Concern, LEHR Southwest Trenches Area Removal Action (continued)

Constituent	Units	Number of Samples > Detection Limit[1]	Number of Detections > Background	Background Concentration	Maximum Detected Concentration	95% UCL	RME[2]	Carc. RBAS Scenario 1	Carc. RBAS Scenario 2	Carc. RBAS Scenario 3	Non-Carc. RBAS Scenario 1	Non-Carc. RBAS Scenario 2	Non-Carc. RBAS Scenario 3	**Carc. Scen. 1 RME/RBAS Ratio**	**Carc. Scen. 2 RME/RBAS Ratio**	**Carc. Scen. 3 RME/RBAS Ratio**	**Non-Carc. Scen. 1 RME/RBAS Ratio**	**Non-Carc. Scen. 2 RME/RBAS Ratio**	**Non-Carc. Scen. 3 RME/RBAS Ratio**	**Carc. RME/ Residential PRG Ratio**	**Non-Carc. RME/ Residential PRG Ratio**
SVOCs																					
Acenaphthene	ug/kg	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	41,000,000.0	250,000.0	100,000,000.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anthracene	ug/kg	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	200,000,000.0	1,400,000.0	100,000,000.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzo(a)anthracene	ug/kg	0	0	n/a	n/a	n/a	n/a	2,600.00	1,200.00	30,000,000.00	n/a	n/a	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzo(a)pyrene	ug/kg	0	0	n/a	n/a	n/a	n/a	260.00	240.00	1,300,000.00	n/a	n/a	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzo(b)fluoranthene	ug/kg	0	0	n/a	n/a	n/a	n/a	2,600.00	3,300.00	12,000,000.00	n/a	n/a	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzo(g,h,i)perylene	ug/kg	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	20,000,000.0	9,100,000.0	100,000,000.0	0.00	0.00	0.00	0.00	0.00	0.00	n/a	n/a
Benzo(k)fluoranthene	ug/kg	0	0	n/a	n/a	n/a	n/a	26,000.00	27,000.00	100,000,000.00	n/a	n/a	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bis(2-Ethylhexyl)phthalate	ug/kg	0	0	n/a	n/a	n/a	n/a	136,000.00	7,700.00	8,600.00	n/a	n/a	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carbazole	ug/kg	0	0	n/a	n/a	n/a	n/a	95,000.00	2,200.00	100,000,000.00	n/a	n/a	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysene	ug/kg	0	0	n/a	n/a	n/a	n/a	260,000.00	20,000.00	100,000,000.00	n/a	n/a	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dibenzo(a,h)anthracene	ug/kg	0	0	n/a	n/a	n/a	n/a	260.00	540.00	260,000.00	n/a	n/a	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dibenzofuran	ug/kg	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2,700,000.0	14,000.0	100,000,000.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diethyl Phthalate	ug/kg	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	550,000,000.0	220,000.0	100,000,000.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Di-n-Butylphthalate	ug/kg	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	68,000,000.0	890,000.0	3,300,000.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Di-n-Octylphthalate	ug/kg	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	14,000,000.0	28,000,000.0	4,900,000.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fluoranthene	ug/kg	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	27,000,000.0	1,800,000.0	100,000,000.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fluorene	ug/kg	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	27,000,000.0	170,000.0	100,000,000.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Indeno(1,2,3-cd)pyrene	ug/kg	0	0	n/a	n/a	n/a	n/a	2,600.00	4,900.00	4,600,000.00	n/a	n/a	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Naphthalene	ug/kg	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	27,000,000.0	39,000.0	100,000,000.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pentachlorophenol	ug/kg	0	0	n/a	n/a	n/a	n/a	16,000.00	13,000.00	100,000,000.00	n/a	n/a	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phenanthrene	ug/kg	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	20,000,000.0	1,200,000.0	100,000,000.0	0.00	0.00	0.00	0.00	0.00	0.00	n/a	n/a
Pyrene	ug/kg	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	20,000,000.0	490,000.0	100,000,000.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOCs																					
2-Butanone	ug/kg	9	9	0.00	548.00	n/a	548.00	n/a	n/a	n/a	710,000.0	12,000.0	n/a	n/a	n/a	n/a	0.00	0.05	n/a	n/a	0.00
Acetone	ug/kg	1	1	0.00	14.90	n/a	14.90	n/a	n/a	n/a	710,000.0	12,000.0	n/a	n/a	n/a	n/a	0.00	0.00	n/a	n/a	0.00
Benzene	ug/kg	0	0	0.00	n/a	n/a	n/a	230.00	15.00	n/a	710,000.0	12,000.0	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carbon Tetrachloride	ug/kg	0	0	0.00	n/a	n/a	n/a	220.00	55.00	n/a	710,000.0	12,000.0	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EthylBenzene	ug/kg	13	13	0.00	2.87	2.16	2.16	n/a	n/a	n/a	2,400,000.0	10,000.0	n/a	n/a	n/a	n/a	0.00	0.00	n/a	n/a	0.00
Methylene Chloride	ug/kg	0	0	0.00	n/a	n/a	n/a	7,200.00	130.00	n/a	710,000.0	12,000.0	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Styrene	ug/kg	1	1	0.00	1.03	n/a	1.03	n/a	n/a	n/a	710,000.0	12,000.0	n/a	n/a	n/a	n/a	0.00	0.00	n/a	n/a	0.00
Toluene	ug/kg	40	40	0.00	438.00	99.56	99.56	920,000.00	19,000.00	n/a	710,000.0	12,000.0	n/a	0.00	0.01	n/a	0.00	0.01	n/a	n/a	0.00
Xylenes (Total)	ug/kg	23	23	0.00	16.40	7.69	7.69	n/a	n/a	n/a	710,000.0	12,000.0	n/a	n/a	n/a	n/a	0.00	0.00	n/a	n/a	0.00
													SUM OF RME/RBAS RATIO:	**1.44**	**1.45**	**0.06**	**0.02**	**0.92**	**0.16**	**10.67**	**0.36**

* The RBAS for this COC was less than the background value. Per the Workplan, a background comparison was conducted. The COC data set was determined to mirror the background data set. Therefore, the COC was not considered a contributor to excess risk from the site, and a RME/RBAS ratio was not calculated for inclusion in the cumulative summation.

[1] For radionuclides, this value identifies the number of samples that exceeded the MDA.

[2] RME is the reasonable maximum exposure. The 95% UCL on the mean was used when available If a 95% UCL was not available, the maximum detected concentration was used.

Abbreviations:
Carc. = Carcinogenic
μg/kg = microgram per kilogram
mg/kg = milligram per kilogram
pCi/g = picoCurie per gram
RBAS = Risk-Based Action Standards
RME = reasonable maximum exposure
UCL = upper confidence level
n/a = not applicable

Table 6-5. Summary of Compiled Reasonable Maximum Exposure/Risk-Based Action Standard Ratios, LEHR Southwest Trenches Area Removal Action

Risk Level	Carc. Scenario 1	Carc. Scenario 2	Carc. Scenario 3	Non-Carc. Scenario 1	Non-Carc. Scenario 2	Non-Carc. Scenario 3
10^{-6}	1.44	1.45	0.05	N/A	N/A	N/A
10^{-5}	0.14	0.14	0.005	N/A	N/A	N/A
10^{-4}	0.01	0.01	0.0005	N/A	N/A	N/A
HQ=1.0	N/A	N/A	N/A	0.02	0.91	0.16

Abbreviations

Carc.	Carcinogenic
HQ	Hazard Quotient
N/A	not applicable
Non-Carc.	Non-Carcinogenic

Table 6-6. Constituents of Concern that Exceeded USEPA Residential Preliminary Remediation Goal Values, LEHR Southwest Trenches Area Removal Action

Carcinogenic Constituents of Concern that Exceeded USEPA Residential PRG Values (10^{-6})	RME	USEPA Residential PRG
Cesium-137	0.05 pCi/g	0.02 pCi/g
Chromium VI (hexavalent)	0.42 mg/kg	0.20 mg/kg
Cobalt-60	0.01 pCi/g (1)	0.0043 pCi/g
Lead-210	1.55 pCi/g	0.78 pCi/g
Thorium-234	0.86 pCi/g	0.69 pCi/g

Notes
There were no non-carcinogenic COCs that exceeded the Residential PRGs.
(1) The laboratory detection limit for Cobalt-60 was 0.01 pCi/g; the USEPA PRG value is less than this detection limit. There were no values of Cobalt-60 reported above the detection limit for the 70 samples at the Site.

Abbreviations
mg/kg milligrams per kilogram
N/A not applicable
pCi/g picoCuries per gram
PRG Preliminary Remediation Goal
RME Reasonable Maximum Exposure
USEPA U.S. Environmental Protection Agency

Table 6-7. Hot Measurement Analysis, LEHR Southwest Trenches Area Removal Action

Carcinogenic Constituents of Concern that Exceeded Hot Measurement Upper Limit(1)	Hot Measurement Maximum	Values Greater than Hot Measurement Upper Limit
Cesium-137	1.0 pCi/g	One value (1.18 pCi/g)

Notes

There were no non-carcinogenic COCs that exceeded Hot Measurement Upper Limits.
(1) Hot Measurement Upper Limit for carcinogens = 10 x RBAS value for 10^{-6} risk level.

Abbreviations

RBAS	Risk-Based Action Standards
pCi/g	picoCuries per gram

Table 6-8. Preliminary Screening of Designated Level Constituents of Concern from Confirmation Sampling Results, LEHR Southwest Trenches Area Removal Action

		STEP 1		STEP 2				STEP 3		
Constituent	Units	Number of Samples with Detections	Background/ Detection Limit [1]	Number of Detections above Background/ Detection Limit	Max. Detected Concentration	% of Detections above Background/ Detection Limit	Is Max Conc. > 1.5xBKG AND % Detection above BKG>5%?	Partitioning Coefficient (Kd) (mL/g) [2]	Half-Life (Years) [3]	Does the Analyte Fail the Kd OR 1/2 life Test?
General Chemistry										
Nitrogen, Nitrate	mg/kg	40	36	18	909	29%	YES	0	NA	YES
Metals [5]										
Antimony	mg/kg	19	1.4	1	1.5	2%	NO	4.50E+01	NA	NO
Arsenic	mg/kg	63	9.6	0	9.5	0%	NO	2.00E+02	NA	NO
Barium	mg/kg	63	260	1	286	2%	NO	6.00E+01	NA	NO
Beryllium	mg/kg	63	0.72	0	0.64	0%	NO	2.50E+02	NA	NO
Chromium, Hexavalent	mg/kg	42	0.054	42	1.06	67%	YES	1.00E+01	NA	YES
Chromium	mg/kg	63	181	7	314	11%	YES	3.00E+01	NA	YES
Cobalt	mg/kg	63	31	0	26.2	0%	NO	6.00E+01	NA	NO
Copper	mg/kg	63	60	0	51.5	0%	NO	3.50E+01	NA	NO
Iron	mg/kg	63	44000	1	44200	2%	NO	1.65E+02	NA	NO
Lead	mg/kg	63	9.5	1	10.3	2%	NO	2.70E+02	NA	NO
Manganese	mg/kg	63	750	6	968	10%	YES	5.00E+01	NA	YES
Mercury	mg/kg	63	0.63	23	6.1	37%	YES	1.00E+01	NA	YES
Molybdenum	mg/kg	29	*0.26*	29	0.48	46%	YES	1.00E+01	NA	YES
Nickel	mg/kg	63	330	3	369	5%	NO	3.00E+02	NA	NO
Selenium	mg/kg	19	1.2	3	1.6	5%	NO	1.50E+02	NA	NO
Silver	mg/kg	9	0.55	2	0.75	3%	NO	9.00E+01	NA	NO
Thallium	mg/kg	6	1.6	0	1.4	0%	NO	1.50E+03	NA	NO
Vanadium	mg/kg	63	77	3	83.9	5%	NO	1.00E+03	NA	NO
Zinc	mg/kg	63	87	1	150	2%	YES	2.00E+02	NA	YES
Pesticides/PCBs										
4,4'-DDD	μg/kg	6	*3.6*	6	11.5	10%	YES	7.81E+03	NA	NO
4,4'-DDE	μg/kg	28	*3.6*	28	26.8	44%	YES	6.07E+03	NA	NO
4,4'-DDT	μg/kg	6	*3.6*	6	276	10%	YES	1.92E+04	NA	NO
alpha-Chlordane	μg/kg	44	*1.7*	44	110	70%	YES	3.72E+03	NA	NO
delta-BHC	μg/kg	1	*1.9*	1	0.12	2%	NO	1.61E+02	NA	NO
Dieldrin	μg/kg	1	*3.8*	1	0.63	2%	NO	4.46E+02	NA	NO
Endosulfan Sulfate	μg/kg	1	*3.8*	1	0.086	2%	NO	4.46E+01	NA	NO
gamma-Chlordane	μg/kg	44	*1.7*	44	94.6	70%	YES	3.72E+03	NA	NO
Heptachlor	μg/kg	12	*1.8*	12	16.7	19%	YES	2.31E+02	NA	NO
PCB-1254	μg/kg	3	*34.6*	3	26.1	5%	NO	5.41E+01	NA	NO
PCB-1260	μg/kg	1	*39.6*	1	9.7	2%	NO	5.41E+01	NA	NO
Radionuclides [6]										
Actinium-228	pCi/g	62	0.64	17	0.769	27%	YES	0.00E+00	7.02E-04	NO
Americium-241	pCi/g	5	*0.014*	3	1.61	5%	YES	1.00E+03	4.33E+02	NO
Bismuth-212	pCi/g	61	0.43	24	0.761	38%	YES	1.00E+02	1.15E-04	NO
Bismuth-214	pCi/g	57	0.54	16	0.64	25%	YES	1.00E+02	3.79E-05	NO
Carbon-14	pCi/g	26	*0.13*	26	5.84	41%	YES	0.00E+00	5.73E+03	YES
Cesium-137	pCi/g	9	0.012	8	1.18	13%	YES	1.00E+02	3.02E+01	YES
Lead-210	pCi/g	7	1.6	2	4.43	3%	YES	1.00E+02	2.23E+01	YES

Table 6-8. Preliminary Screening of Designated Level Constituents of Concern from Confirmation Sampling Results, LEHR Southwest Trenches Area Removal Action (continued)

Constituent	Units	STEP 1		STEP 2				STEP 3		
		Number of Samples with Detections	Background/ Detection Limit [1]	Number of Detections above Background/ Detection Limit	Max. Detected Concentration	% of Detections above Background/ Detection Limit	Is Max Conc. > 1.5xBKG AND % Detection above BKG>5%?	Partitioning Coefficient (Kd) (mL/g) [2]	Half-Life (Years) [3]	Does the Analyte Fail the Kd OR 1/2 life Test?
Lead-212	pCi/g	63	0.7	10	0.76	16%	YES	1.00E+02	1.21E-03	NO
Lead-214	pCi/g	63	0.58	37	0.772	59%	YES	1.00E+02	5.14E-05	NO
Plutonium-241	pCi/g	7	*0.5*	1	0.517	2%	NO	1.00E+03	1.44E+01	NO
Potassium-40	pCi/g	60	14	11	15.3	17%	YES	0.00E+00	1.28E+09	YES
Radium-226	pCi/g	63	0.75	1	0.757	2%	NO	1.00E+02	1.60E+03	NO
Radium-228	pCi/g	62	0.64	17	0.769	27%	YES	1.00E+02	5.76E+00	YES
Strontium-90	pCi/g	24	0.056	21	7.911	33%	YES	1.00E+01	2.91E+01	YES
Thallium-208	pCi/g	63	0.22	8	0.239	13%	YES	1.50E+03	5.80E-06	NO
Thorium-228	pCi/g	63	0.74	5	0.894	8%	YES	1.00E+03	3.64E-06	NO
Thorium-230	pCi/g	63	0.79	2	1.12	3%	NO	1.00E+03	7.50E+04	NO
Thorium-232	pCi/g	64	0.75	0	0.731	0%	NO	1.00E+03	1.40E+10	NO
Thorium-234	pCi/g	29	0.78	19	3.74	30%	YES	1.00E+03	6.60E-02	NO
Tritium	pCi/g	12	*1.2*	12	5.2	19%	YES	0.00E+00	1.23E+01	YES
Uranium-233/234	pCi/g	63	0.68	0	0.562	0%	NO	1.00E+01	2.45E+05	NO
Uranium-235	pCi/g	50	0.039	3	0.0551	5%	NO	1.00E+01	7.04E+08	NO
Uranium-238	pCi/g	63	0.65	0	0.626	0%	NO	1.00E+01	4.47E+09	NO
SVOCs										
None										
VOCs										
1,1-Dichloroethylene	µg/kg	1	*10*	1	0.793	2%	NO	1.97E+00	NA	NO
2-Butanone	µg/kg	9	*10*	9	548	14%	YES	2.40E-02	NA	YES
Acetone	µg/kg	1	*12.2*	1	14.9	2%	YES	7.19E-03	NA	YES
Chlorobenzene	µg/kg	1	*10*	1	0.661	2%	NO	5.87E+00	NA	NO
Dichlorobromomethane	µg/kg	1	*11.4*	1	0.234	2%	NO	1.06E+00	NA	NO
Ethyl Benzene	µg/kg	13	*10*	13	2.87	21%	YES	1.30E+00	NA	YES
Methyl Bromide	µg/kg	1	*10.6*	1	0.693	2%	NO	2.52E+00	NA	NO
Styrene	µg/kg	1	*11.4*	1	1.03	2%	NO	2.20E+00	NA	NO
Tetrachloroethene	µg/kg	1	*10.5*	1	0.916	2%	NO	2.14E+00	NA	NO
Toluene	µg/kg	40	*10*	40	438	63%	YES	1.50E+00	NA	YES
Trichloroethene	µg/kg	3	*10*	3	0.573	5%	NO	8.91E+00	NA	NO
Xylenes (Total)	µg/kg	23	*10*	23	16.4	37%	YES	1.40E+00	NA	YES

Table 6-8. Preliminary Screening of Designated Level Constituents of Concern from Confirmation Sampling Results, LEHR Southwest Trenches Area Removal Action (continued)

Notes

(1) For VOCs and pesticides, the lowest reportable detection limit was used for background concentration *(in italics)*.
(2) K_d values are based on the lowest reasonable value observed in literature and site-specific vadose zone modeling data that relate Kd to the time-to-peak in ground water.
(3) Half-life values obtained from "Handbook of Environmental Degradation Rates" by Howard, Boethling, Jarvis, Meylan, and Michalenko 1991. Criteria is based on site-specific information regarding time of last waste burial and process knowledge regarding levels of radionuclide activity used at LEHR for research.
(4) A constituent is considered a Designated Level Constituent of Concern if its K_d is less than 10 mL/g (organics) or 1,000 mL/g (radionuclide), or the half-life is greater than 1 year.
(5) Metals list does not include: Aluminum, calcium, magnesium, potassium, or sodium results. No background data were available for these elements.
(6) Gross alpha and non-volatile beta results are not included in this table. These parameters were analyzed as indicators for alpha and beta emitting radionuclides.

Abbreviations

BKG	Background
DL	Detection Limit
K_d	distribution coefficient
Max.	Maximum
mg/kg	milligrams per kilogram
mL/g	milliliters per gram
NA	Not Applicable
pCi/g	picoCuries per gram
SVOCs	semivolatile organic compounds
VOCs	volatile organic compounds
μg/kg	micrograms per kilogram

Table 6-9. Step 4. Designated Level Constituent of Concern Determination from Confirmation Sampling Results, LEHR Southwest Trenches Area Removal Action

COC Count	Constituent	Units	Background/DL Concentration [1]	Number of Detections above Background/DL	Max. Detected Concentration	% Detections above Background/DL	Partitioning Coefficient (K_d) (ml/g) [2]	Half-Life (Years) [3]	DLR (mg/kg or pCi/g)	Is Constituent a Designated Level COC?	Explanation
	General Chemistry										
1	Nitrogen, Nitrate	mg/kg	36	18	909	29%	0	NA	10	YES	Requires evaluation based on regional data
	Metals										
2	Chromium, Hexavalent	mg/kg	0.054	42	1.06	67%	1.00E+01	NA	1.2	NO	Below Designated Level Result [4]
3	Chromium	mg/kg	181	7	314	11%	3.00E+01	NA	NA	NO	WRS/Quantile Test, See Histogram
4	Manganese	mg/kg	750	6	968	10%	5.00E+01	NA	NA	NO	WRS/Quantile Test
5	Mercury	mg/kg	0.63	23	6.1	37%	1.00E+01	NA	NA	YES	Requires additional evaluation
6	Molybdenum	mg/kg	*0.26*	29	0.48	46%	1.00E+01	NA	NA	NO	Less than 2 x BKG, No MCLs
7	Zinc	mg/kg	87	1	150	2%	2.00E+02	NA	NA	NO	Only 1 of 63 samples >BKG (less than 2 x BKG)
	Pesticides/PCBs										
	None										
	Radionuclides										
8	Carbon-14	pCi/g	*0.13*	24	5.84	38%	0.00E+00	5.73E+03	NA	YES	Requires additional sampling
9	Cesium-137	pCi/g	0.012	8	1.18	13%	1.00E+02	3.02E+01	NA	YES	Requires additional sampling
10	Lead-210	pCi/g	1.6	2	4.43	3%	1.00E+02	2.23E+01	NA	NO	Only two detections above BKG
11	Potassium-40	pCi/g	14	11	15.3	17%	0.00E+00	1.28E+09	NA	NO	WRS/Quantile Test
12	Radium-228	pCi/g	0.64	17	0.769	27%	1.00E+02	5.76E+00	NA	NO	WRS/Quantile Test
13	Strontium-90	pCi/g	0.056	21	7.911	33%	1.00E+01	2.91E+01	1.70E+01	NO	Below Designated Level Result [4]
14	Tritium	pCi/g	*1.2*	12	5.2	19%	0.00E+00	1.23E+01	NA	YES	Requires additional sampling
	SVOCs										
	None										
	VOCs										
15	2-Butanone	µg/kg	*10*	9	548	14%	2.40E-02	NA	NA	NO	Low concentration and biodegradable
16	Acetone	µg/kg	*12.2*	1	14.9	2%	7.19E-03	NA	NA	NO	Low concentration and biodegradable
17	EthylBenzene	µg/kg	*10*	13	2.87	21%	1.30E+00	NA	NA	NO	Low concentration and biodegradable
18	Toluene	µg/kg	*10*	40	438	63%	1.50E+00	NA	NA	NO	Low concentration and biodegradable
19	Xylenes (Total)	µg/kg	*10*	23	16.4	37%	1.40E+00	NA	NA	NO	Low concentration and biodegradable

Notes

[1]For VOCs and pesticides, the lowest reportable detection limit (DL) was used for the background concentration *(in italics)*.

[2]K_d values are based on the lowest reasonable value observed in literature and site-specific vadose zone modeling data that relate Kd to the time-to-peak in ground water.

[3]Half-life values obtained from "Handbook of Environmental Degradation Rates" by Howard, Boethling, Jarvis, Meylan, and Michalenko 1991. Criteria are based on site-specific information regarding time of last waste burial and process knowledge regarding levels of radionuclide activity used at LEHR for research.

[4]Designated Level Results (DLR) were calculated for the compound using the following conservative assumptions: leachate COC protective of ground water at background level of COC 50% infiltration rate, depth of 11-18 ft bgs.

Abbreviations

BKG	Background
COC	constituent of concern
DL	designated level
mg/kg	milligrams per kilogram
NA	Not Applicable
PCBs	polychlorinated biphenyls
pCi/g	picoCuries per gram
SVOCs	semivolatile organic compounds
VOCs	volatile organic compounds
WRS	Wilcoxon Rank Sum Test

Table 6-10. Summary Evaluation of Potential Impact of Designated-Level Constituents of Concern in Southwest Trenches Soil on Ground Water, LEHR Site, UC Davis, California

COC	Confirmation Sampling		Confirmation	DL Sampling		Soil Background Value	NUFT Soil Result	NUFT Soil Result	Summary of Ground Water Impact Potential
	Maximum (mg/kg or pCi/g)	Depth of Maximum (ft)	95% UCL (mg/kg or pCi/g)	Maximum (mg/kg or (pCi/g)	Depth of Maximum (ft)	(mg/kg or pCi/g)	(BG goal) (mg/kg or pCi/g)	(MCL goal) (mg/kg or pCi/g)	
Mercury[1]	6.1	4	0.98	NA	NA	0.63	0.0265	2.74	Localized impact above background possible; impact above MCL unlikely; note peak time for ground water impact is 5,000 years
Cesium-137	1.18	6	0.05	0.00718	20	0.01	7.04E+09	8.95E+11	Impact above background and/or MCL very unlikely
Nitrate (as N)	NA	NA	NA	822	12.5	36	4.05	1.70	Localized impact above background and MCL possible
Tritium[2]	5.2	4	0.76	0.35	30	1.20	0.0193	3.51	Localized impact above background possible; impact above MCL unlikely
Carbon-14[3]	5.84	3	0.54	0.85	10	0.130	0.000511	0.292	Localized impact above background and MCL possible, but area of impact appears to be outside SWT Area

Notes

[1] Assumed to be as mercuric sulfide.
[2] Assumed to be as water.
[3] Assumed to be as methanol.

Abbreviations

BG	background, based on concentrations in ground water from upgradient well UCD1-18
COC	constituent of concern
DL	designated level
ft	feet
mg/kg	milligrams per kilogram
MCL	Primary Maximum Contaminant Level for Ground Water
N	Nitrogen
NA	not applicable or not available
NUFT	Non-isothermal, Unsaturated Flow and Transport model
pCi/g	picoCuries per gram
UCL	Upper confidence limit on the true mean based on sample data

7. REMOVAL ACTION COMPLETION ANALYSIS

The RA at SWT Area was implemented to locate and remove buried waste and associated contaminated soil to levels that would protect human health and the environment. In the EE/CA Report, (WA, 1998b), five specific objectives were defined for the RA. Each is discussed below.

7.1 RAO 1–Reduce Cancer Risk

The first RAO was to reduce the excess cumulative cancer risk from the site to the nominal range of 10^{-4} to 10^{-6} using 10^{-6} as the point of departure. As discussed in Section 6.2.6.1, the cancer risk for all three scenarios is below 10^{-5}. In addition, excess risk for Scenario 3 is below 10^{-6}. Excess cancer risks for Scenarios 1 and 2 are 1.44×10^{-6} and 1.45×10^{-6}, respectively, which only marginally exceed 10^{-6}. Therefore, this objective has been attained as a result of RA activities by reducing the cumulative cancer risk to a nominal range of 10^{-4} to 10^{-6}.

7.2 RAO 2–Reduce Non-Cancer Hazard Quotient

The second RAO was to reduce the non-cancer HQ below 1.0. As discussed in Section 6.2.6.2, the HQs for Scenarios 1, 2, and 3 are all less than 1. Therefore, this objective has been attained as a result of RA activities by reducing the cumulative non-cancer HQ to less than 1.0.

7.3 RAO 3–Mitigate Ground Water Impact

The third RAO was to mitigate any potential future impacts on ground water associated with residual soil concentrations. The RA removed most of the contaminant mass in the SWT area; therefore the RAO of reducing potential future ground water impacts was likely met. Based on the DL analysis, only nitrate remaining in SWT soil may impact local ground water above the MCL and background. However, this potential impact appears to be insignificant compared to other nitrate impacts in the area. Mercury and tritium in SWT soil may result in localized impact above background, but well below MCLs. Cs-137 in SWT soil is not expected to have any measurable impact on ground water.

7.4 RAO 4–Mitigate Ecological Risk

The fourth RAO was to mitigate potential ecological risks during and after the RA. During the RA, mitigation measures (fencing) were taken to protect sensitive habitat on-site. No impact to ecological receptors was observed during the RA. No ecological risk screening has been performed at the site. Hence, no ecological risk-based screening standards are available for comparison and evaluation of this RAO. However, one can use the human health risk as a benchmark for estimating the likelihood of mitigating risk to the environment. Since the RA achieved the human health risk standards which were very conservative (Section 6.2.2), it is likely that ecological risks were also mitigated. Attainment of this RAO, however, will be determined during a toluene site-wide ecological risk analysis.

7.5 RAO 5–Minimize Disruption to University Research

The fifth RAO was to minimize disruption to University research activities while conducting the RA. The RA implemented at the Southwest Trenches during the summer of 1998 did not significantly disrupt University research and therefore this objective has been attained.

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9. ACKNOWLEDGMENTS

The following LEHR Project personnel worked on the LEHR Final Southwest Trenches Area 1998 Removal Action Confirmation Report:

Name and Position	Responsibility
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APPENDIX A

WASTE CHARACTERIZATION RESULTS

APPENDIX A

WASTE CHARACTERIZATION RESULTS

CONTENTS

WASTE CHARACTERIZATION RESULTS

During the Removal Action (RA), several waste streams were generated which require characterization prior to disposal or reuse. The waste streams are:

- Chlordane contaminated soil;
- Disposal cell waste:
  - Soil and gravel from disposal cell; and,
  - Laboratory-related and solid waste;
- Overburden soil (soil above waste); and,
- Liquid waste generated from decontamination activities.

The waste streams were stored either in stockpiles in the Western Dog Pens (WDP), containerized in B-25 boxes, containerized in 5-gallon buckets or in 55-gallon drums. Each waste stream has been characterized in accordance with the Waste Management Plan (WMP) and related sampling plans. Below is a description of the sampling activities and the analytical results for each waste stream.

A.1 Chlordane Contaminated Soil

Approximately 350 cu. yds. of chlordane-contaminated soil was generated as a result of the RA surface soil excavations. The procedures for characterizing this soil were in accordance with the Sampling and Analysis Plan for Chlordane Stockpile Characterization, Rev.0, dated July 10, 1998 (Weiss Associates, 1998). The chlordane-contaminated soil was separated and placed into six engineered stockpiles for sampling and storage.

A.1.1 Sampling Activities

To characterize the chlordane stockpile, one four-point composite sample per 20 cu. yds. was collected and sent to an off-site laboratory for analysis. To collect representative samples from the stockpiles, a two-dimensional grid system was designed and superimposed on each stockpile. Based on the stockpile dimensions, the grid spacing was selected as 2 ft. The stockpile volumes greater than 20 cu. yds. was divided into sections equal to or less than 20 cu. yds. Each section contained its own grid system; within each grid system, grid blocks were assigned consecutive numbers. A random number generator was used to select four grids for composite sample collection. The grid system and stockpile dimensions for each pile are presented in Attachment 1 to this appendix.

Once the grids were selected, four discrete samples were collected from within 6 inches of the pile surface using a trowel. The four samples were combined in a stainless steel bowl and homogenized to create one composite sample to be shipped to an off-site laboratory and one composite sample to be analyzed in the on-site laboratory. A secondary composite sample was also collected for every 100 cu. yds. The 20-cu. yd. composite samples shipped to an off-site laboratory were analyzed for radionuclides and pesticides/PCBs (CWDTC001 through CWDTC020). The 100 cu. yd. composite samples shipped to an off-site laboratory were analyzed for metals, VOCs, and SVOCs (CWDTC021, 022, 023, and 025).

Figure A-1 depicts the chlordane stockpiles in Row E of the WDP and summarizes the sample locations. For ease of discussion in this report, the stockpiles are labeled C-1 through C-6, where:

- Stockpile C-1 (approximately 12 cu. yds.) represents soil from grids location W2, S8;
- Stockpile C-2 (approximately 16 cu. yds.) represents grid location W4, S11;
- Stockpile C-3 (approximately 83 cu. yds.) represents soil from 0 to 1 ft from the large southwest corner chlordane excavation;
- Stockpile C-4 (approximately 77 cu. yds.) represents soil from 1 to 2 ft from the large southwest corner chlordane excavation;
- Stockpile C-5 (approximately 120 cu. yds.) represents soil from 2 to 3.5 ft from the large southwest corner chlordane excavation; and,
- Stockpile C-6 (approximately 42 cu. yds.) represents soil from 0 to 3.5 ft from the expansion of the large southwest corner chlordane excavation.

Table A-1 presents a summary of the analytical results for each chlordane stockpile.

Samples CWDTC001 through CWDTC026 were collected from the stockpiles and analyzed as described above. Sample CWDTC025 was also analyzed for paint filter, cyanide reactivity, and sulfide reactivity. Samples CWDTC021 and CWDTC025 were also analyzed for pH. CWDTC024 and CWDTC026 were field duplicates and were not analyzed. In addition, one composite sample each from stockpiles C3, C4, C5, and C6 were analyzed for TCLP-chlordane.

The samples associated with stockpile C-1 are CWDTC001 and CWDT021. The sample associated with stockpile C-2 is CWDTC002. The samples associated with stockpile C-3 are CWDTC005 through CWDTC008 and CWDTC022. The samples associated with stockpile C-4 are CWDTC009 through CWDTC013, CWDTC023, and CWDTC024. The samples associated with stockpile C-5 are CWDTC014 through CWDTC020, CWDTC025 and CWDTC026. Samples associated with stockpile C-6 are CWDTC003 and CWDTC004.

A.1.2 Analytical Results

In this appendix, the waste characterization results have only been evaluated based on constituents detected above the detection limit and not above background since the disposal facilities will only be interested in detected concentrations. The discussion below serves as a summary of what was detected in the stockpile and is not meant to be the final waste characterization for designation and profiling purposes. Waste designation and profiling is currently being conducted and will be reported in a separate document. Also for discussion purposes, only a few constituents will be discussed, which include:

- Metals – mercury;
- Radionuclides – C-14, Cs-137, Pb-210, Ra-226, Sr-90 and tritium;
- Pesticides – alpha-chlordane and gamma-chlordane; and,
- Nitrate.

A.1.2.1 Stockpile C-1

In stockpile C-1, seventeen metals were detected with a maximum detection of mercury at 0.97 mg/kg. Two pesticides were detected with a maximum for alpha-chlordane at 54.2 µg/kg and gamma-chlordane at 60.0 µg/kg. Fourteen radionuclides were detected. The maximum activities were as follows: Cs-137 was 0.02 pCi/g, Ra-226 was 0.41 pCi/g, and Sr-90 was 0.03 pCi/g. Three VOCs, methylene chloride, toluene, and trichloroethane, were also detected.

A.1.2.2 Stockpile C-2

In stockpile C-2, fourteen radionuclides were detected. The maximum activities were as follows: C-14 was 0.165 pCi/g, Cs-137 was 0.0998 pCi/g, Ra-226 was 0.397 pCi/g, and tritium was 1.16 pCi/g. The only pesticides detected were alpha-chlordane at 105 µg/kg and gamma-chlordane at 111 µg/kg.

A.1.2.3 Stockpile C-3

In stockpile C-3, seventeen metals were detected. Mercury was detected at 1.2 mg/kg. Three pesticides were detected. The maximum detection of alpha-chlordane was 87,200 µg/kg and gamma-chlordane was at 103,000 µg/kg. Fifteen radionuclides were detected: Cs-137 at 0.147 pCi/g, Pb-210 at 2.77 pCi/g, Ra-226 at 0.562 pCi/g, and Sr-90 at 0.0375 pCi/g. Two VOCs, methylene chloride and toluene, were also detected.

A.1.2.4 Stockpile C-4

In stockpile C-4, seventeen metals were detected. Mercury was detected at 1.1 mg/kg. Three pesticides were detected with maximums for alpha-chlordane at 16,000 µg/kg and gamma-chlordane at 18,100 µg/kg. Sixteen radionuclides were detected in the stockpile C-4. C-14 activity was 0.125 pCi/g, Cs-137 activity was 0.0269 pCi/g, Pb-210 activity was 2.83 pCi/g, and Ra-226 activity at 0.575 pCi/g. Two VOCs, methylene chloride and toluene, were also detected.

A.1.2.5 Stockpile C-5

In stockpile C-5, seventeen metals were detected with mercury at 1.8 mg/kg. Three pesticides were detected. The maximum detection of alpha-chlordane was 52,200 µg/kg and gamma-chlordane was at 71,200 µg/kg. Fourteen radionuclides were detected. Cesium-137 activity was at

0.0247 pCi/g, Pb-210 activity was at 0.749 pCi/g and Ra-226 activity was at 0.564 pCi/g. One SVOC, dimethyl phthalate, was detected and three VOCs, methylene chloride, toluene and trichloroethene, were detected.

A.1.2.6 Stockpile C-6

In stockpile C-6, three pesticides were detected with alpha-chlordane detected at 519 µg/kg and gamma-chlordane detected at 619 µg/kg. Sixteen radionuclides were detected. Cesium-137 activity was at 0.0163 pCi/g, Pb-210 activity was at 0.929 pCi/g, Ra-226 activity at 0.5 pCi/g, Sr-90 activity at 0.0297 pCi/g, and tritium activity at 1.2 pCi/g.

A.1.2.7 Miscellaneous Waste Characterization

One sample, CWDTC025, from the chlordane stockpile was also analyzed for paint filter, cyanide reactivity, sulfide reactivity, and pH. Cyanide reactivity was 0.38 mg/kg, the paint filter test passed, sulfide reactivity was 0.0706 mg/kg, and pH was 7.89. The pH of sample CWDTC021 was 8.02. These results along with the results presented above are currently being evaluated to designate the waste appropriately.

A.2 Disposal Cell Waste

The disposal cell waste streams were containerized in B-25 boxes, 5-gallon buckets or 55-gallon drums and stored in the WDP or Geriatrics I building.

Table A-2 presents a summary of the analytical results for the B-25 boxes generated from the Southwest Trenches area. A sampling and analysis plan for characterization of the waste in the 5-gallon buckets will be developed to properly characterize and designate the waste.

A.2.1 Soil and gravel from disposal cells

Soil and gravel commingled with laboratory-related solid waste such as syringes, broken vials, broken glass bottles and jars and ceramic crucibles, and animal bones excavated from the disposal cells were placed directly into B-25 box containers. Characterization sampling was conducted as the B-25 boxes were being filled. The samples were collected directly from the excavator bucket using a trowel and putting the soil into pre-sterilized glass jars.

During the RA, the B-25 boxes were segregated into "pre-characterized" and "not-characterized" categories. Pre-characterized boxes included soil excavated from areas where data from the 1996 Limited Field Investigation (LFI) was used to designate the waste. Not-characterized boxes represented all other boxes (non-LFI). The B-25 boxes with LFI waste were not further characterized and were shipped off-site. The non-LFI B-25 boxes were sampled as described above with the exception that every B-25 box generated from the chlordane impacted areas (Excavation W8 and W10) were sampled and analyzed for chlordane by EPA Method 8080.

A.2.1.1 Sampling Activity

Four-point composite samples per 50 cu. yds. of waste, or 16 B-25 boxes, were collected. A random number generator was used to select the boxes to be sampled.

Samples CWDTC028, CWDTC032, CWDTC036, CWDTC040, CWDTC041, CWDTC051 through CWDTC060, and CWDTC064 through CWDTC074 were collected and analyzed for pesticides/PCBs, VOCs, SVOCs, metals, radionuclides, paint filter, reactivity cyanide and sulfide, formaldehyde, TKN and TOC. Two of the samples were field duplicate samples, CWDTC051 and 055.

A.2.1.2 Analytical Results

For discussion purposes only a few constituents will be discussed and they are:

- Metals—mercury;
- Radionuclides—C-14, Cs-137, Pb-210, Ra-226, Sr-90 and tritium;
- Pesticides—alpha chlordane and gamma chlordane; and,
- Nitrate.

Not many samples were collected from the B-25 boxes generated from the Northern Excavation Area because they were LFI boxes. The majority of the samples were from the Western and Southern Excavation Areas.

A.2.1.2.1 Northern Excavation

There were only two composite samples CWDTC057 and CWDTC060 collected from boxes generated from the northern excavation. CWDTC060 had a maximum detection of chromium at 158 mg/kg, 2-butanone at 70.1 μg/kg, and toluene at 27.3 μg/kg.

A.2.1.2.2 Western Excavation

There were eleven composite samples, CWDTC028, CWDTC032, CWDTC036, CWDTC040, CWDTC051 through CWDTC055, CWDTC058 and CWDTC059, collected from the boxes generated from the Western Excavation.

Seventeen metals and hexavalent chromium were detected in eight samples with the maximum detection of mercury at 1.3 mg/kg in sample CWDTC036. Five pesticides were detected in two samples with the maximum detection of alpha-chlordane at 715 μg/kg, and the maximum detection of gamma-chlordane at 654 μg/kg in sample CWDTC051. Twenty radionuclides were detected in nine samples. The maximum Cs-137 activity was 0.0695 pCi/g, maximum Pb-210 activity was 2.02 pCi/g, maximum Ra-226 activity was 2.34 pCi/g, maximum Sr-90 activity was 8.71 pCi/g, and maximum tritium activity was 0.875 pCi/g. Three VOCs, chloroform, ethylbenzene, and xylenes were detected. The maximum detection of nitrate was 1,320 mg/kg.

A.2.1.2.3 Southern Excavation

There were twelve composite samples, CWDTC056, and CWDTC064 through CWDTC074, collected from the boxes generated from the Southern Excavation.

Twenty-one metals and hexavalent chromium were detected in eight samples with the maximum detection of mercury at 2.2 mg/kg. The only pesticides detected were alpha-chlordane and gamma-chlordane with maximum concentrations at 394 µg/kg and 385 µg/kg, respectively, in sample CWDTC067. Eighteen radionuclides were detected in seven samples. The maximum C-14 activity was 177 pCi/g, maximum Cs-137 activity was 176 pCi/g, maximum Pb-210 activity was 4.61pCi/g, maximum Ra-226 activity was 0.557 pCi/g, and maximum Sr-90 activity was 0.603 pCi/g. One SVOC, bis(2-ethylexyl)phthalate, was detected at 192 µg/kg. Eight VOCs were detected in five samples. The VOCs were benzene, chlorodibromomethane, chloroform, dichlorobromomethane, ethylbenzene, methylene chloride, toluene, and xylenes were detected. The maximum detection of nitrate was 40.4 mg/kg.

A.2.1.2.4 Miscellaneous Waste Characterization

Seventeen samples, CWDTC028, CWDTC032, CWDTC036, CWDTC040, CWDTC051 through CWDTC060, CWDTC062, CWDTC068, and CWDTC071, from the B-25 boxes were also analyzed for cyanide reactivity, formaldehyde, nitrogen as ammonia, TKN, sulfide reactivity, total organic carbon, and paint filter test. The maximum results for:

- cyanide reactivity was 0.267 mg/kg in sample CWDT032;
- formaldehyde was 6.12 mg/kg in sample CWDTC071;
- nitrogen as ammonia was 95 mg/kg in sample CWDTC053;
- TKN was 591 mg/kg in sample CWDTC032;
- sulfide reactivity was 10.9 mg/kg in sample CWDTC051;
- total organic carbon was 27,800 mg/kg in sample CWDTC055; and,
- paint filter test passed.

These results along with the results presented above are currently being evaluated to designate the waste appropriately.

A.2.2 Laboratory-Related and Solid Waste

Waste items such as vials, glass jars and bottles that were intact and contained residual liquid or solid matter were stored in 5-gallon poly buckets. A sampling and analysis plan for characterization of this waste will be developed to properly characterize and designate the waste.

A.3 Overburden soil

Approximately 450 cu. yds. of overburden soil were generated as part of the RA. The procedures for characterizing this soil were in accordance to the Sampling and Analysis Plan described in the Work Plan, Revision D, July 22, 1998. Overburden soil was sampled to determine whether it was suitable for reuse in the excavations as backfill material. The analytical results have been compared to background and Risk-Based Action Standards (RBAS) as needed.

A.3.1 Sampling Activities

To characterize the overburden stockpile, one four-point composite sample per 50 cu. yds. was collected and sent to an off-site laboratory for analysis. To collect representative samples from the stockpile, a two-dimensional grid system was designed and superimposed on each stockpile. Based on the stockpile dimensions, the grid spacing was selected as 2 ft. The stockpile volumes greater than 50 cu. yds. were divided into sections equal or less than 50 cu. yds. Each section contained its own grid system and within each grid system, grid blocks were assigned consecutive numbers. A random number generator was used to select four grids for composite sample collection. The grid system and stockpile dimensions for each pile are presented in Attachment 2 of this appendix.

Once the grids were selected, four discrete samples were collected from within 6 inches of the pile surface using a trowel. The four samples were combined in a stainless steel bowl and homogenized to create one composite sample to be shipped to an off-site laboratory. The composite samples (CWDTC042 through CWDTC050) were analyzed for radionuclides, pesticides/PCBs, metals, VOCs, SVOCs, and general chemistry.

Figure A-2 depicts the overburden stockpiles in Row D of the WDP and summarizes the sample locations. For ease of discussion in this document, the stockpiles are labeled O-1 and O-2, where stockpile O-1 is approximately 158 cu. yds. and represents soil from 0-3 ft and stockpile O-2 is approximately 233 cu. yds. and represents soil from 0-3 ft.

Table A-2 presents a summary of the overburden analytical results.

A.3.2 Analytical Results

A.3.2.1 Metals

Soil samples were analyzed for metals using the United States Environmental Protection Agency (EPA) Solid Waste (SW) 846 Methods 6010 and 7471. Most of the 19 metals analyzed were detected in one or more of the nine samples. However, only lead, mercury, and selenium exceeded background levels. Lead exceeded its background value of 9.5 mg/kg only in one sample at a concentration of 10.8 mg/kg. Mercury exceeded its background level of 0.99 mg/kg (depth-stratified background value for soil) in six samples but did not exceed its carcinogenic Risk-Based Action Standards (RBAS) value of 15 mg/kg or the preliminary remediation goal (PRG) of 22 mg/kg in any of the samples. The mercury non-carcinogenic RBAS of 0.22 mg/kg for Scenario 2 was exceeded in all samples. Finally, selenium was detected in a range of 1.0 to 1.5 mg/kg and exceeded its background value of 1.2 mg/kg in three samples, but did not exceed its RBAS in any sample.

The analytical results for most metals are within the background concentration range and are below their respective RBAS values in all cases except for mercury. All mercury results are less than two times the background value. Background values appear to be stratified by depth with higher concentrations in the upper 3 feet and can potentially explain why overburden soil concentrations are currently greater than the consolidated background value.

A.3.2.2 Hexavalent Chromium, Nitrogen, and Total Organic Carbon (TOC)

Hexavalent chromium exceeded its background level of 0.054 mg/kg in all nine samples, however, none of the samples exceeded the RBAS value of 3.8 mg/kg.

Nitrogen (N) was analyzed in all soil samples as ammonia, nitrate, and Total Kjeldahl Nitrogen (TKN). Nitrate as N slightly exceeded the background value of 36 mg/kg in one sample at a concentration of 36.2 mg/kg. Ammonia concentrations ranged from 6.39 to 10.8 mg/kg, while TKN concentrations ranged from 48.4 to 214 mg/kg. No site background values have been established for these parameters.

TOC concentrations ranged from 3,530 to 5,240 mg/kg. No site background value has been established for TOC.

A.3.2.3 Pesticides/PCBs

All soil samples were analyzed for pesticides/PCBs using EPA SW-846 Method 8080. Alpha-chlordane, gamma-chlordane and heptachlor were the only pesticides detected in the soil samples. Alpha- and gamma-chlordane were detected in all nine samples; however, neither exceeded its respective RBAS level. Heptachlor was detected in one of the nine samples but did not exceed its RBAS value.

A.3.2.4 Volatile Organic Compounds (VOCs)

All soil samples were analyzed for VOCs using EPA SW-846 Method 8260. The VOCs that were detected included 2-butanone, chloroform, ethylbenzene, methylene chloride, toluene, trans-1,3-dichloropropene, and total xylenes. All the detected VOCs were near or below the quantitation limit, and were below their respective RBAS values.

A.3.2.5 Semi-Volatile Organic Compounds (SVOCs)

All soil samples were analyzed for SVOCs using EPA SW-846 Method 8270. None of the SVOCs were detected in the nine soil composite samples collected from the overburden stockpile.

A.3.2.6 Radiochemistry

The radionuclides that exceed their background values included bismuth-212 (Bi-212), Bi-214, cesium-137 (Cs-137), gross alpha, lead-210 (Pb-210), Pb-214, nonvolatile beta, strontium-90 (Sr-90), and thorium-234 (Th-234). Bi-212 and Bi-214 exceeded their background values in one sample by 0.01 pCi/g. Cs-137 exceeded its background value of 0.043 pCi/g in one sample at an activity of 0.0564 pCi/g. However, all Cs-137 results are below the RBAS value.

Gross alpha, Pb-210, Pb-214 and nonvolatile beta exceeded their background levels in 2, 1, 3 and 4 samples respectively. Sr-90 was detected above background in 3 samples, however Sr-90 did not exceed its RBAS value in any of the samples. Thorium-234 exceeded its background in one sample but did not exceed its RBAS value in any sample.

A.4 Investigation-Derived Waste

Four 55-gallon drums were filled with decontamination water generated during the RA. A composite sample WSDTC003 was collected from the drums and analyzed for VOCs, pesticides, radionuclides, hexavalent chromium and nitrate.

The only VOCs detected were chloroethane at 3.2 µg/L and acetone at 11.5 µg/L. Only three pesticides, 4,4'-DDT at 0.070 µg/L, alpha-chlordane at 0.067 µg/L, and gamma-chlordane at 0.088 µg/L were detected in the sample. Gross alpha at 2.12 pCi/L, gross beta at 5.95 pCi/L and Ra-226 at 0.511 pCi/L were detected from the composite sample. Nitrate was detected at 0.215 mg/L and hexavalent chromium was not detected. These results are currently being evaluated to designate the waste appropriately.

ATTACHMENT 1

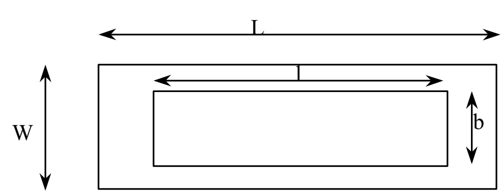
Table 1. Chlordane Stockpile Area and Volume Calculation

STOCKPILE	Base Length L	BaseWidth W (ft)	Top Width b (ft)	Top Length l (ft)	Side s (ft)	Height h (ft)	Volume Vb (CY)	Stockpile Volume Vs (CY)
W2S8 Pile	10	18	10	4	5	3.0	7.5	12
W4S14/W4S11/W7S14 Pile	12	16	9	6	5	3.6	11	16
0-1' Pile	39	20	7	26	8	4.7	63	83
1-2' Pile	39	19	6	26	8	4.7	63	77
2-3.5' Pile	55	20	8	43	7.5	4.5	95	120
0-3.5' EXTRA Pile	24	18	7	13	7	4.3	22	42
TOTAL							262	351

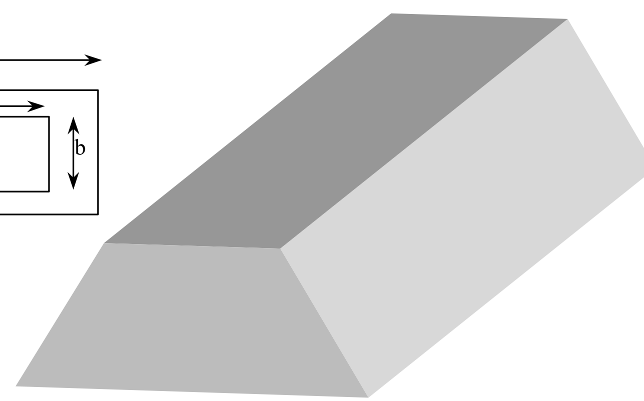
Assumption: Stockpiles are shaped as Trapezoids.
Equations:

$$h = \sqrt{\left(\frac{W-b}{2}\right) - s^2}$$

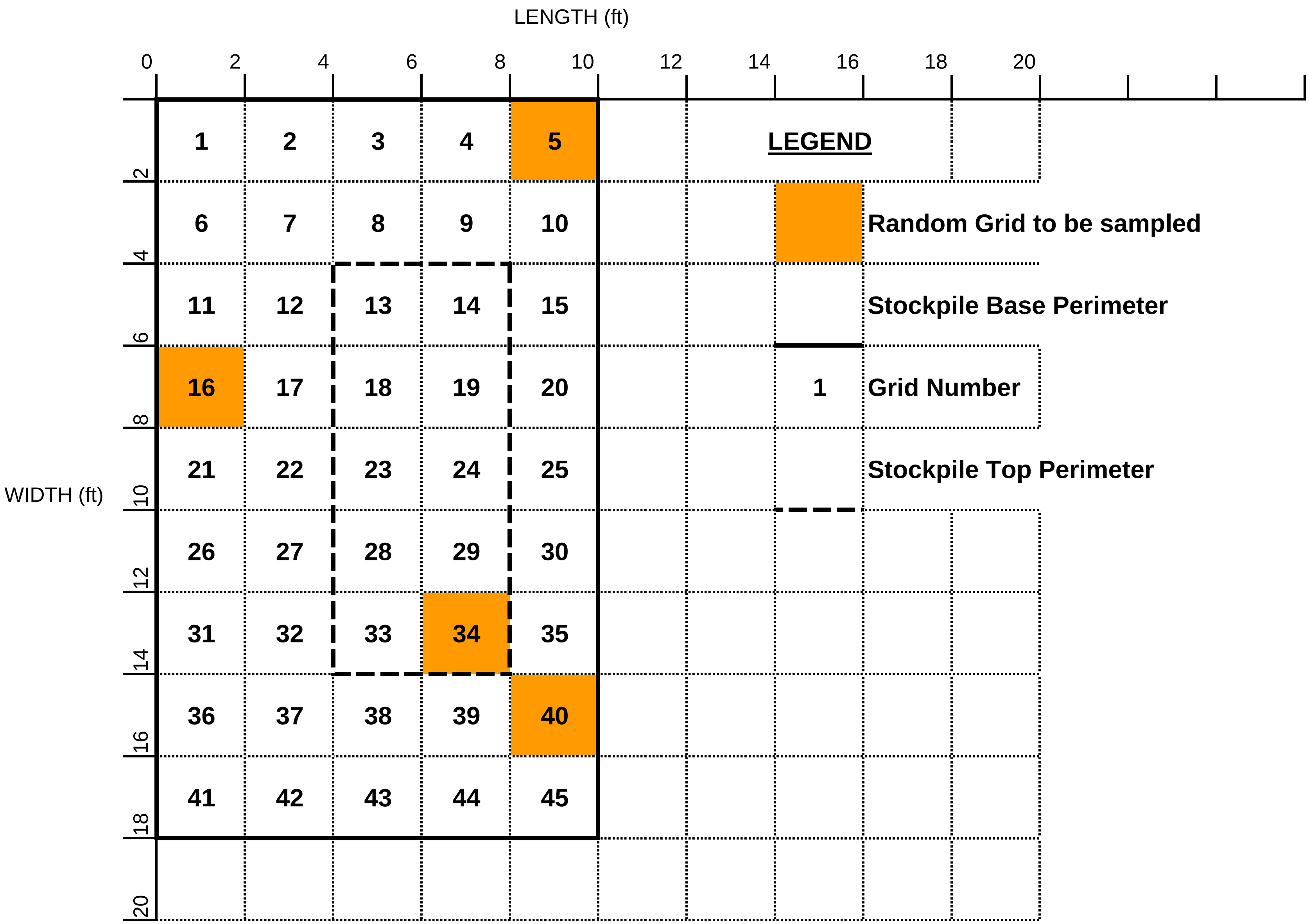
$$Vs = \frac{h \times 0.5 \times (W \times L + b \times l)}{27}$$



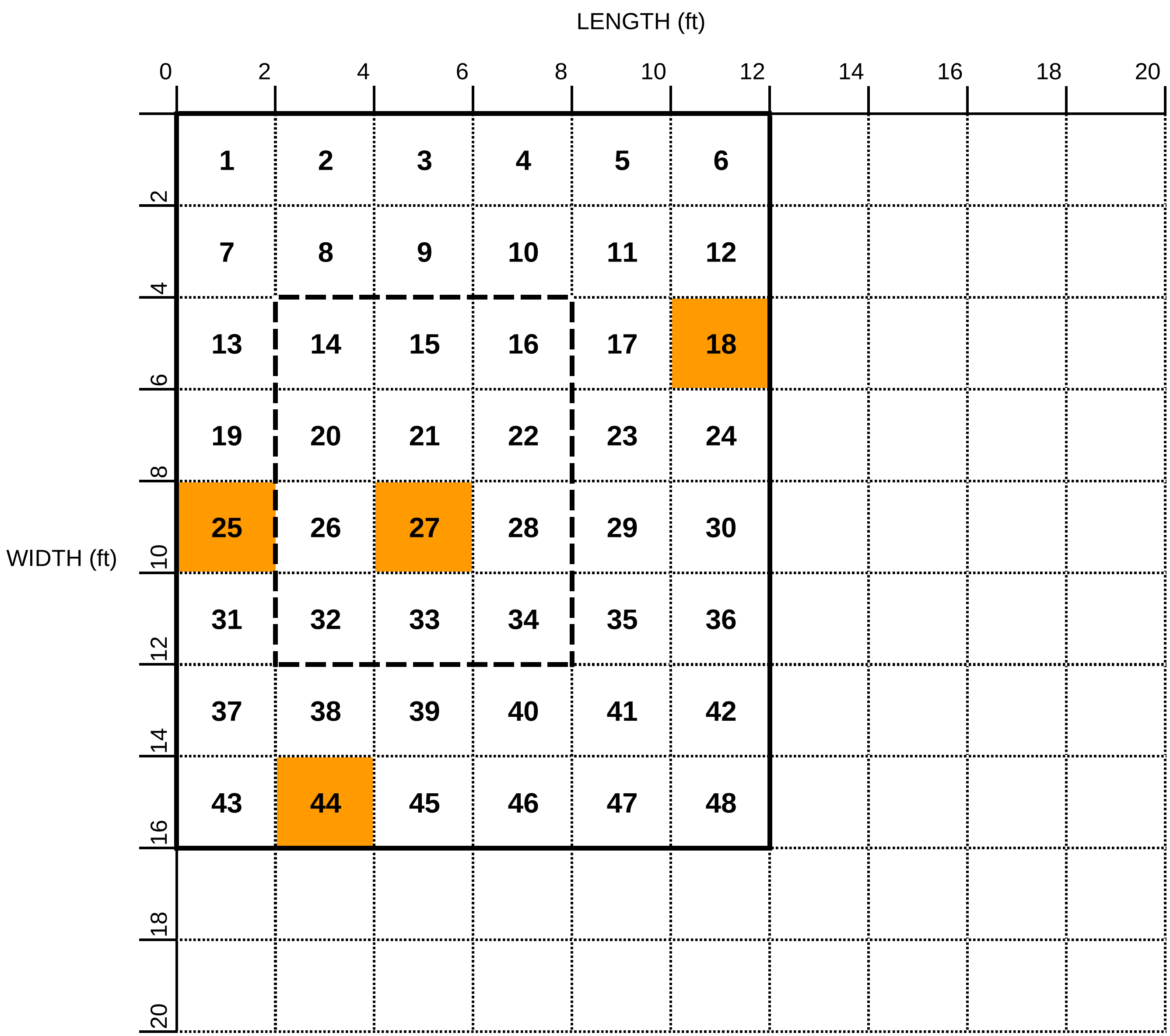
STOCKPILE PLAN VIEW



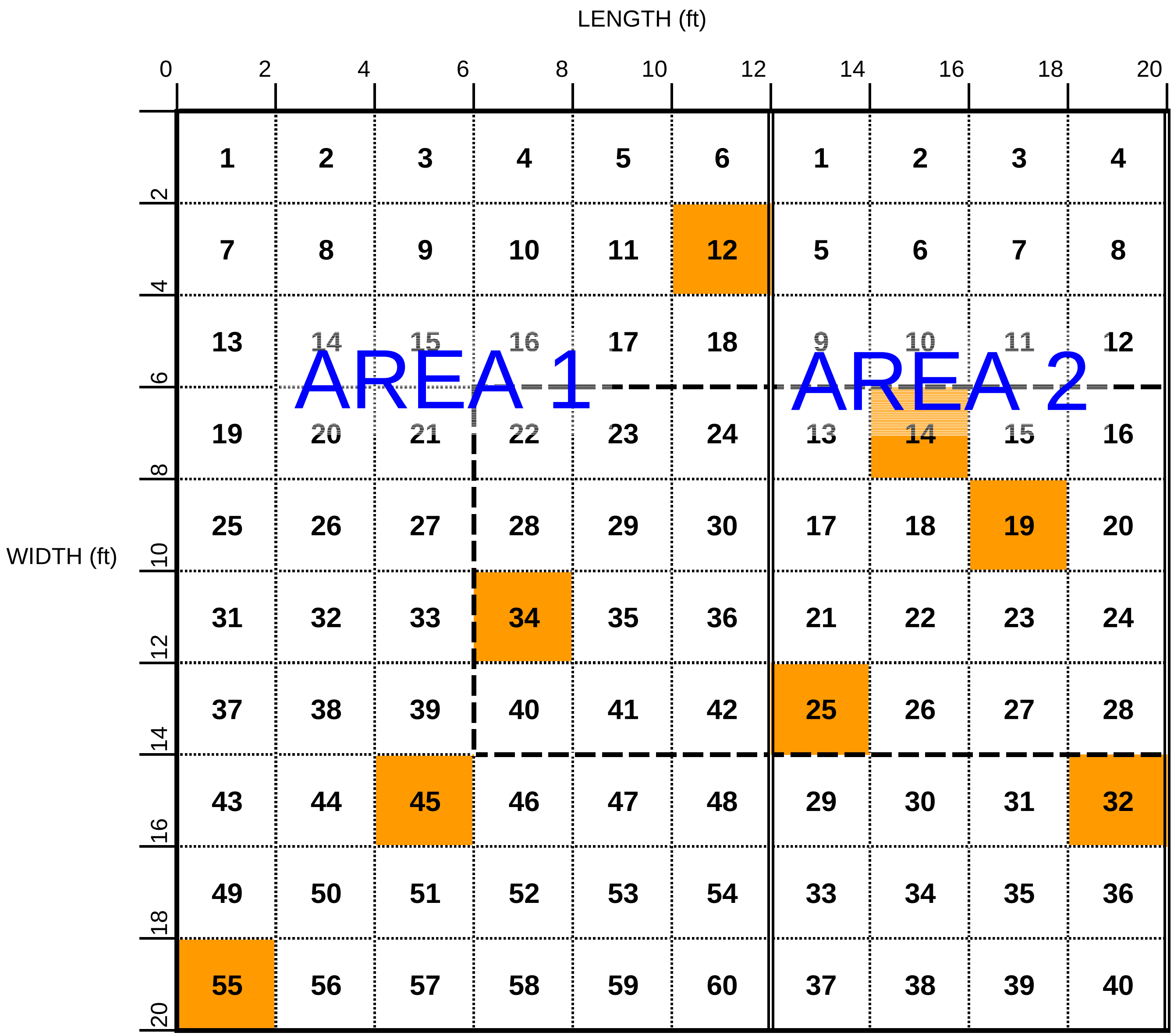
W2S8 Stockpile Grid Sampling



Stockpile W4S11/W4S14/W7S14 Grid Sampling



Stockpile 0-1' Depth Grid Sampling



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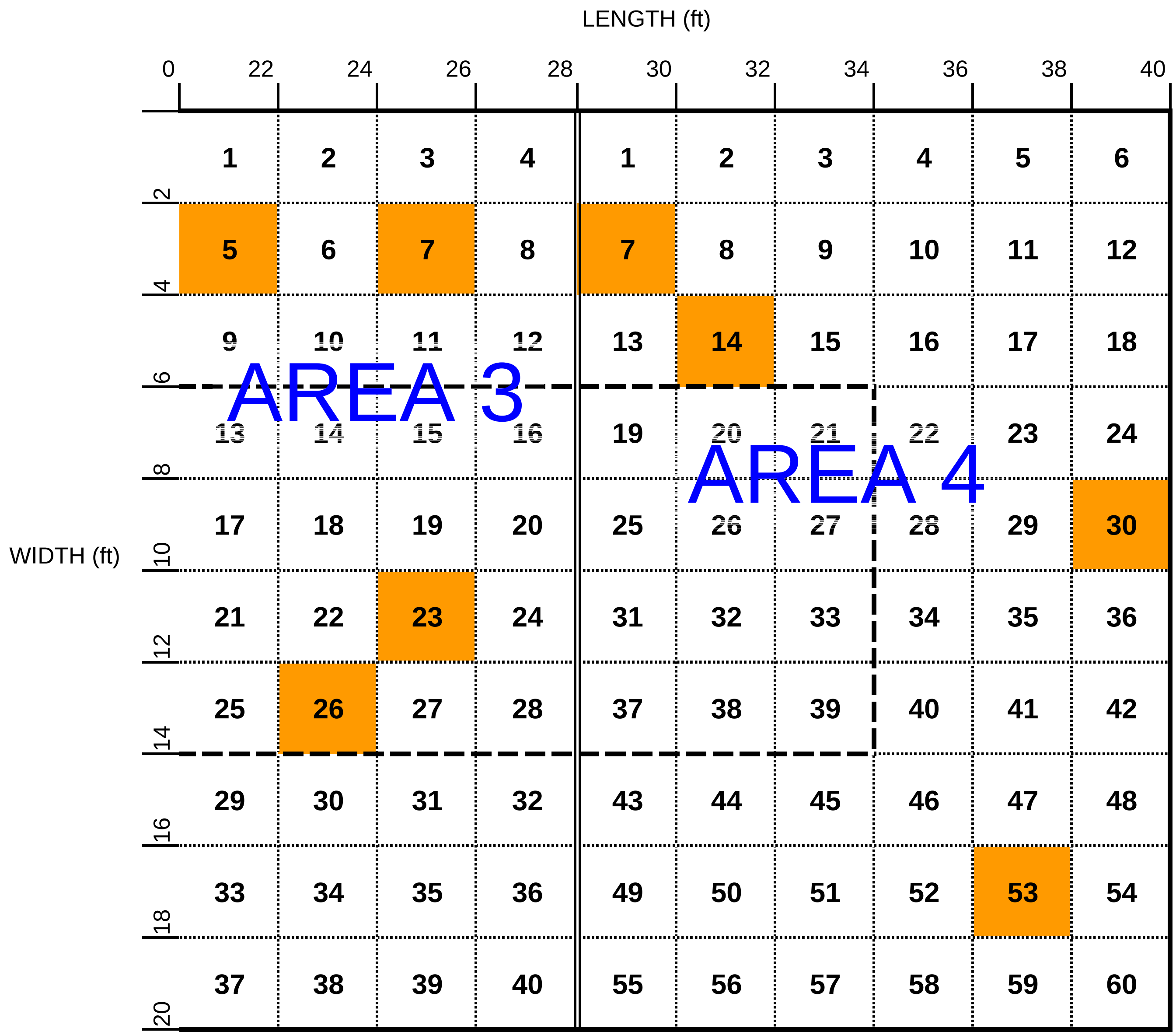

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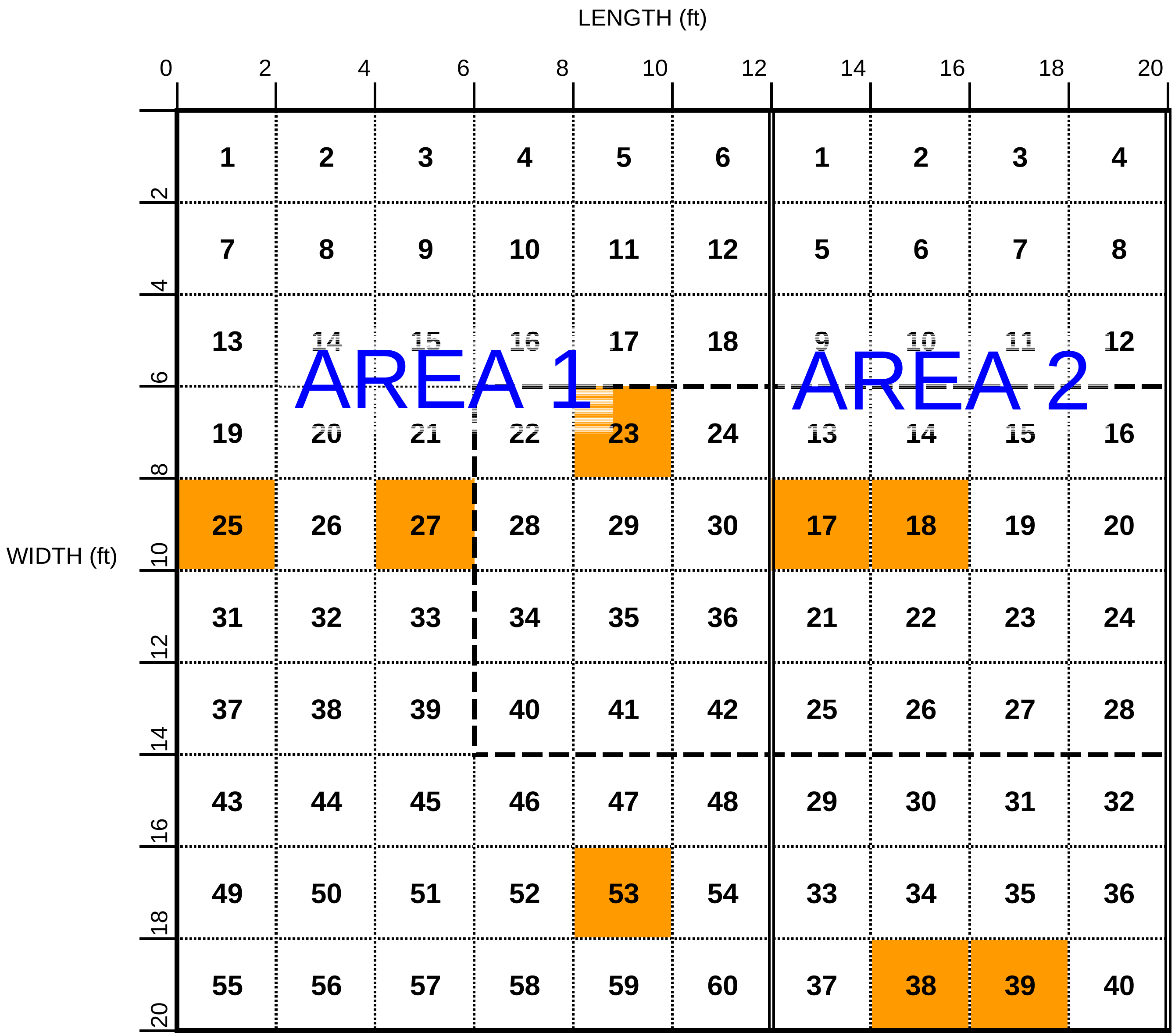

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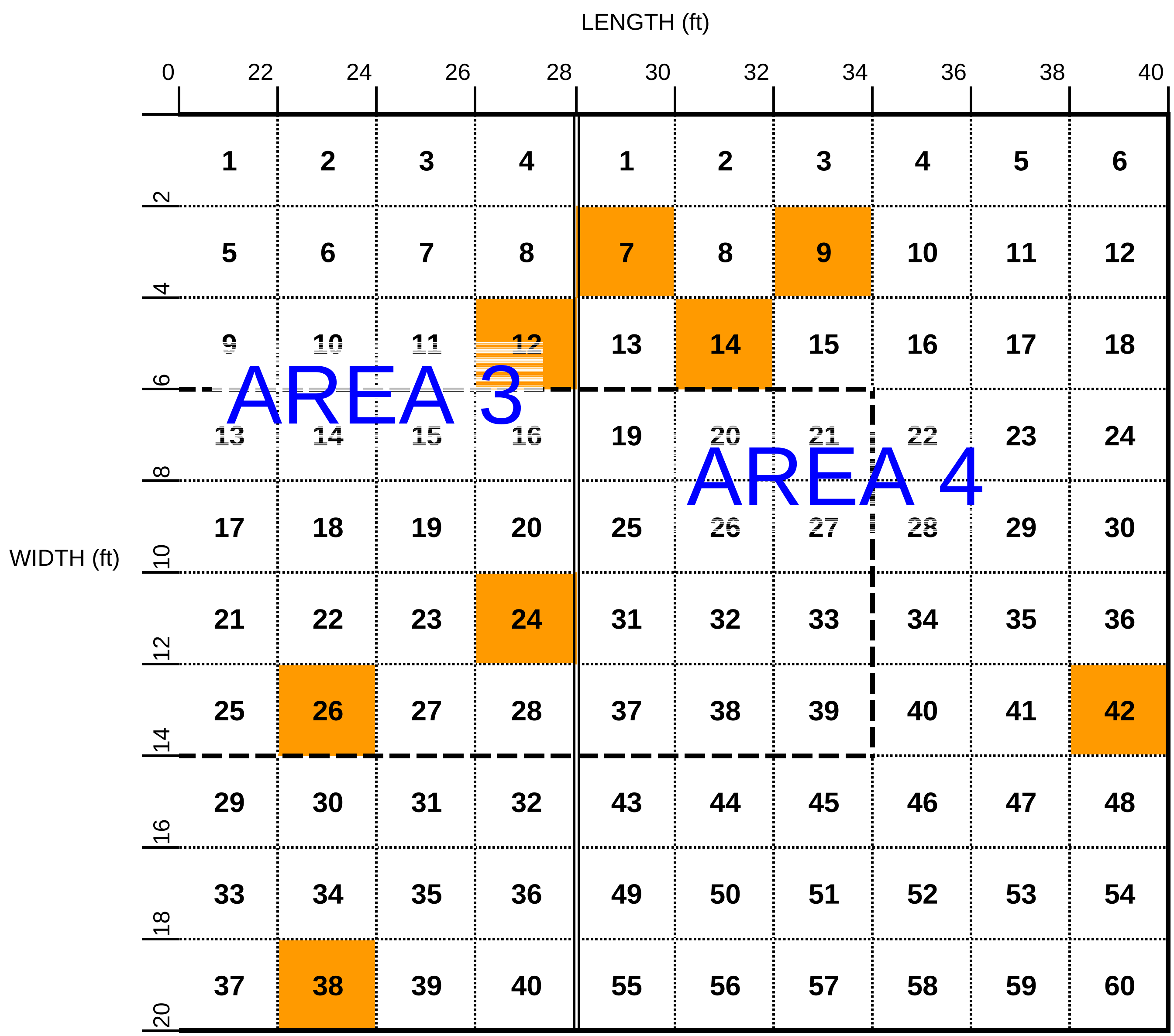
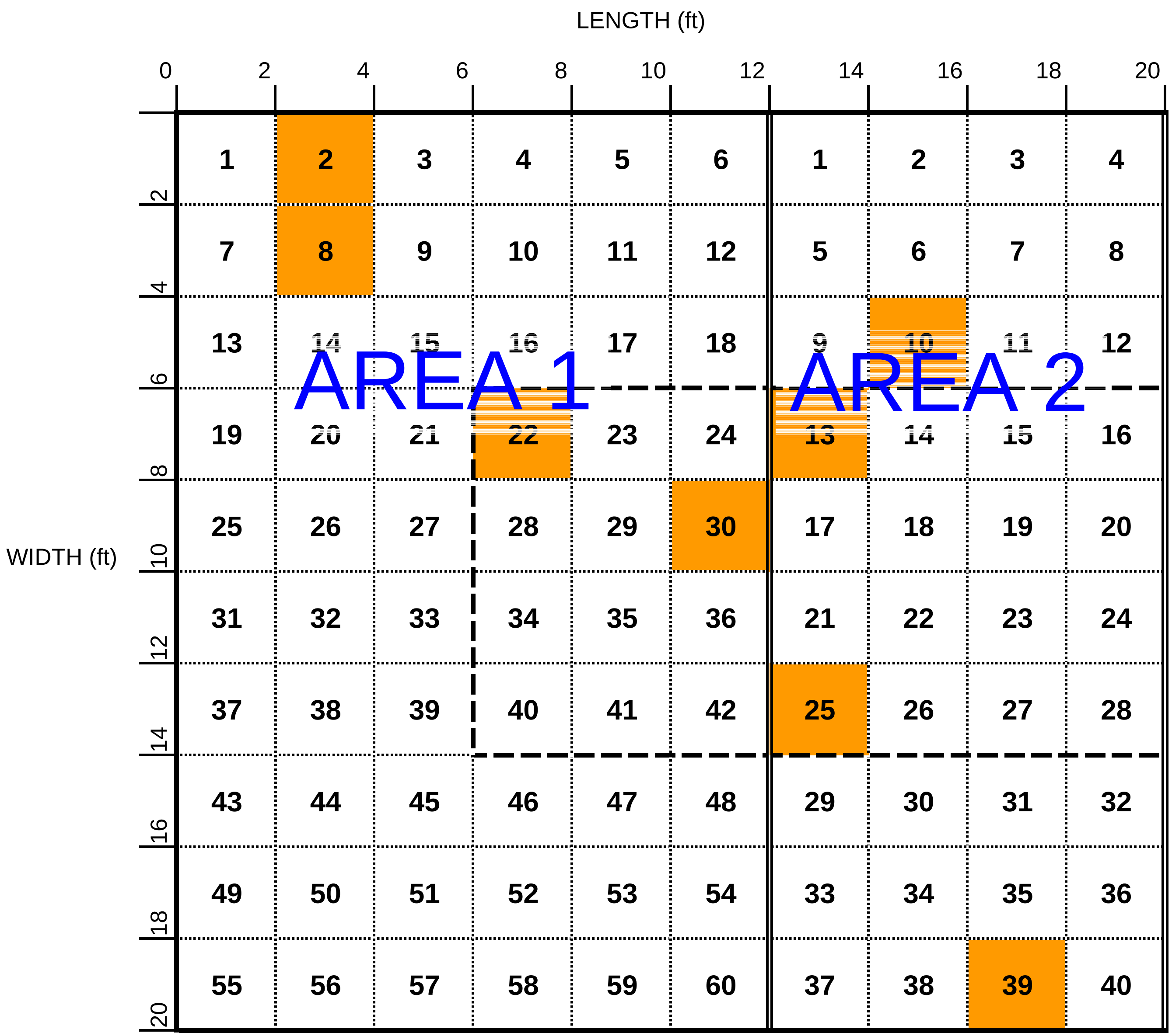
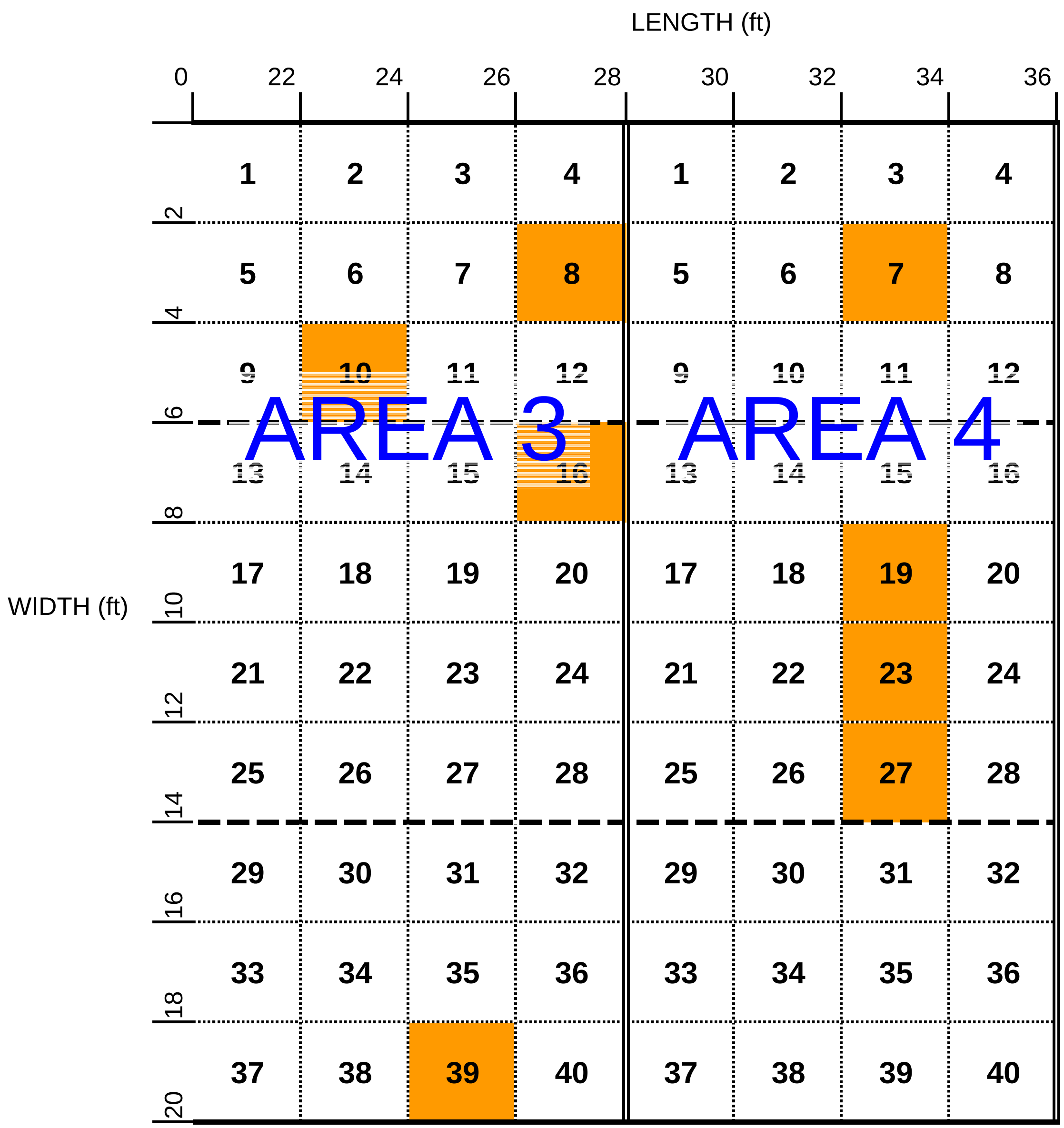


Stockpile 2-3.5' Depth Grid Sampling

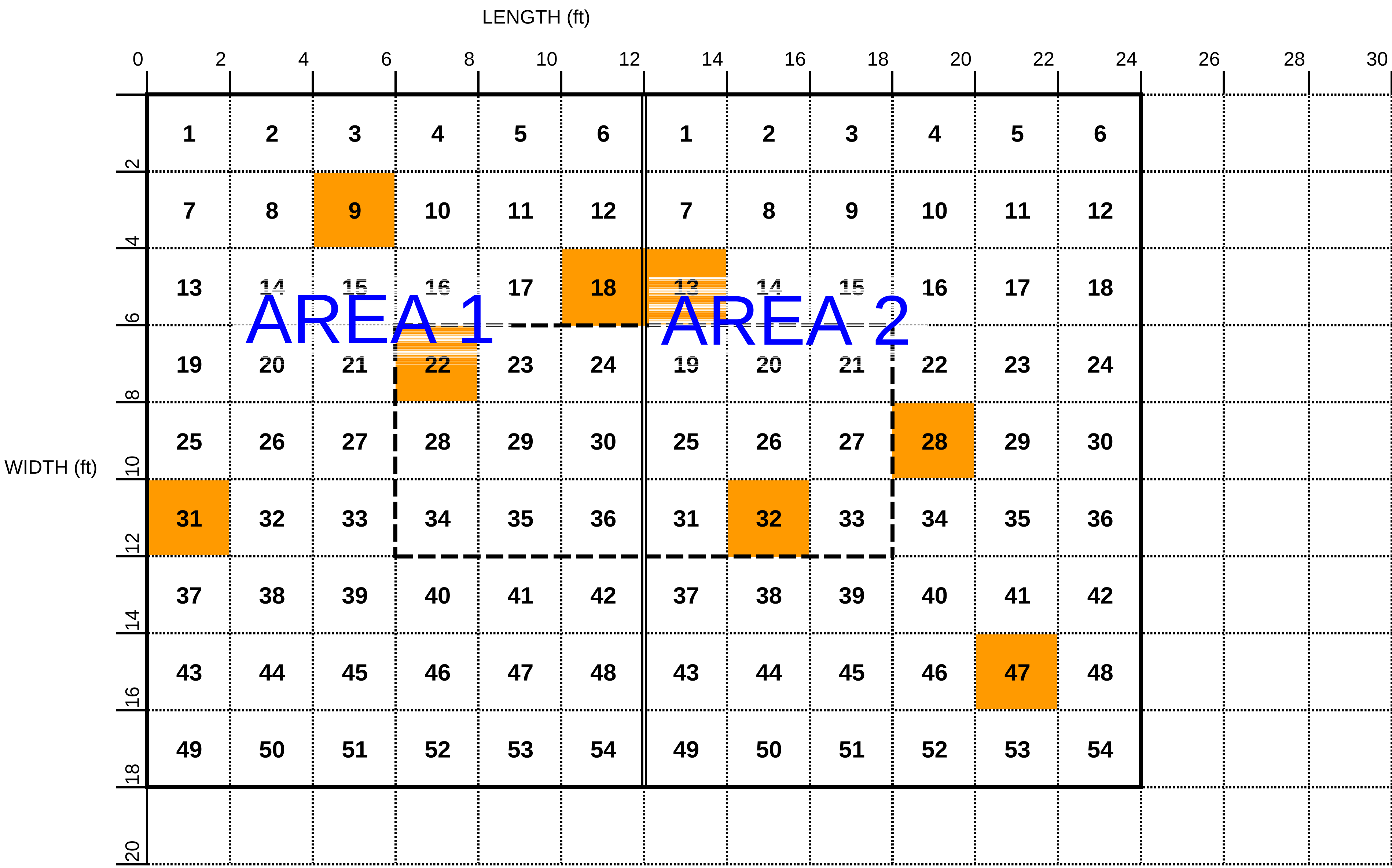


Stockpile 2-3.5' Depth Grid Sampling



Stockpile 2-3.5' Depth Grid Sampling

Stockpile 0-3.5' EXTRA Pile Grid Sampling



ATTACHMENT 2

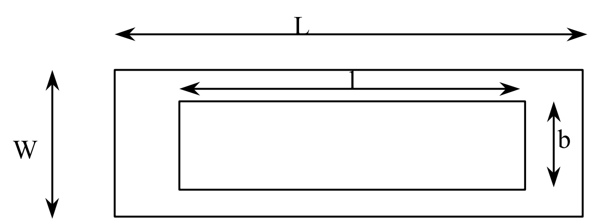
Table 1. Chlordane Stockpile Area and Volume Calculation

STOCKPILE	Base Length L	BaseWidth W (ft)	Top Width b (ft)	Top Length l (ft)	Side s (ft)	Calculated Height h (ft)	Measured Bank Volume Vb (CY)	Calculated Stockpile Volume Vs (CY)
Western Pile	66	18	7.5	54	7.5	5.4		158
Eastern Pile	114	20	8.5	102	7	4.0		233
TOTAL							0	391

Assumption: Stockpiles are shaped as Trapezoids.
Equations:

$$h = \sqrt{\left(\frac{W - b}{2}\right) - s^2}$$

$$Vs = \frac{h \times 0.5 \times (W \times L + b \times l)}{27}$$



STOCKPILE PLAN VIEW

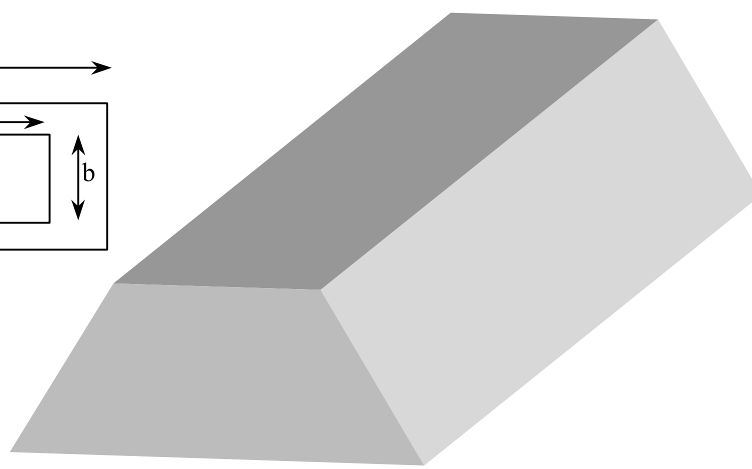


Table A1. Summary of Constituents Detected in Chlordane Stockpile Generated from the Southwest Trenches Area Removal Action

Constituent	Units	Maximum Concentration	Sample Identification of Maximum Concentration	Composite Sample Depth Range (ft bgs)
STOCKPILE C1				
METALS				
Antimony	mg/kg	0.49	CWDTC021	0-1
Arsenic	mg/kg	5.00	CWDTC021	0-1
Barium	mg/kg	113.00	CWDTC021	0-1
Beryllium	mg/kg	0.26	CWDTC021	0-1
Chromium	mg/kg	111.00	CWDTC021	0-1
Cobalt	mg/kg	15.10	CWDTC021	0-1
Copper	mg/kg	24.50	CWDTC021	0-1
Iron	mg/kg	23200.00	CWDTC021	0-1
Lead	mg/kg	12.20	CWDTC021	0-1
Manganese	mg/kg	453.00	CWDTC021	0-1
Mercury	mg/kg	0.97	CWDTC021	0-1
Molybdenum	mg/kg	0.23	CWDTC021	0-1
Nickel	mg/kg	187.00	CWDTC021	0-1
Selenium	mg/kg	1.50	CWDTC021	0-1
Thallium	mg/kg	0.88	CWDTC021	0-1
Vanadium	mg/kg	41.40	CWDTC021	0-1
Zinc	mg/kg	62.30	CWDTC021	0-1
PESTICIDES				
alpha-Chlordane	µg/kg	54.20	CWDTC001	0-1
gamma-Chlordane	µg/kg	60.00	CWDTC001	0-1
RADIONUCLIDES				
Actinium-228	pCi/g	0.46	CWDTC001	0-1
Cesium-137	pCi/g	0.02	CWDTC001	0-1
Lead-212	pCi/g	0.49	CWDTC001	0-1
Plutonium-241	pCi/g	0.47	CWDTC001	0-1
Potassium-40	pCi/g	8.97	CWDTC001	0-1
Radium-226	pCi/g	0.41	CWDTC001	0-1
Strontium-90	pCi/g	0.03	CWDTC001	0-1
Thallium-208	pCi/g	0.13	CWDTC001	0-1
Thorium-228	pCi/g	0.37	CWDTC001	0-1
Thorium-230	pCi/g	0.41	CWDTC001	0-1
Thorium-232	pCi/g	0.30	CWDTC001	0-1
Thorium-234	pCi/g	0.87	CWDTC001	0-1
Uranium-233/234	pCi/g	0.47	CWDTC001	0-1
Uranium-238	pCi/g	0.39	CWDTC001	0-1
VOCs				
Methylene Chloride	µg/kg	3.00	CWDTC021	0-1
Toluene	µg/kg	1.30	CWDTC021	0-1
Trichloroethene	µg/kg	14.20	CWDTC021	0-1

Table A1. Summary of Constituents Detected in Chlordane Stockpile Generated from the Southwest Trenches Area Removal Action (continued)

Constituent	Units	Maximum Concentration	Sample Identification of Maximum Concentration	Composite Sample Depth Range (ft bgs)
STOCKPILE C2				
RADIONUCLIDES				
Cesium-137	pCi/g	0.10	CWDTC002	0-1
Thallium-208	pCi/g	0.13	CWDTC002	0-1
Lead-212	pCi/g	0.44	CWDTC002	0-1
Radium-226	pCi/g	0.40	CWDTC002	0-1
Carbon-14	pCi/g	0.17	CWDTC002	0-1
Actinium-228	pCi/g	0.44	CWDTC002	0-1
Uranium-238	pCi/g	0.40	CWDTC002	0-1
Uranium-233/234	pCi/g	0.44	CWDTC002	0-1
Thorium-232	pCi/g	0.30	CWDTC002	0-1
Thorium-230	pCi/g	0.47	CWDTC002	0-1
Thorium-228	pCi/g	0.46	CWDTC002	0-1
Thorium-234	pCi/g	0.65	CWDTC002	0-1
Tritium	pCi/g	1.16	CWDTC002	0-1
Potassium-40	pCi/g	9.75	CWDTC002	0-1
PESTICIDES				
gamma-Chlordane	µg/kg	111.00	CWDTC002	0-1
alpha-Chlordane	µg/kg	105.00	CWDTC002	0-1
STOCKPILE C3				
METALS				
Antimony	mg/kg	0.62	CWDTC022	0-1
Arsenic	mg/kg	6.90	CWDTC022	0-1
Barium	mg/kg	144.00	CWDTC022	0-1
Beryllium	mg/kg	0.36	CWDTC022	0-1
Chromium	mg/kg	121.00	CWDTC022	0-1
Cobalt	mg/kg	18.70	CWDTC022	0-1
Copper	mg/kg	31.60	CWDTC022	0-1
Iron	mg/kg	30000.00	CWDTC022	0-1
Lead	mg/kg	8.90	CWDTC022	0-1
Manganese	mg/kg	536.00	CWDTC022	0-1
Mercury	mg/kg	1.20	CWDTC022	0-1
Molybdenum	mg/kg	0.26	CWDTC022	0-1
Nickel	mg/kg	215.00	CWDTC022	0-1
Selenium	mg/kg	2.00	CWDTC022	0-1
Thallium	mg/kg	2.20	CWDTC022	0-1
Vanadium	mg/kg	54.10	CWDTC022	0-1
Zinc	mg/kg	74.80	CWDTC022	0-1
PESTICIDES				
alpha-Chlordane	µg/kg	87200.00	CWDTC006	0-1
Chlordane	µg/L	386.00	TCLP-chlordane	0-1
gamma-Chlordane	µg/kg	103000.00	CWDTC006	0-1
Heptachlor	µg/kg	36400.00	CWDTC006	0-1

Table A1. Summary of Constituents Detected in Chlordane Stockpile Generated from the Southwest Trenches Area Removal Action (continued)

Constituent	Units	Maximum Concentration	Sample Identification of Maximum Concentration	Composite Sample Depth Range (ft bgs)
RADIONUCLIDES				
Actinium-228	pCi/g	0.52	CWDTC005	0-1
Cesium-137	pCi/g	0.15	CWDTC005	0-1
Lead-210	pCi/g	2.77	CWDTC008	0-1
Lead-212	pCi/g	0.58	CWDTC005	0-1
Potassium-40	pCi/g	12.00	CWDTC005	0-1
Radium-226	pCi/g	0.56	CWDTC008	0-1
Strontium-90	pCi/g	0.04	CWDTC008	0-1
Thallium-208	pCi/g	0.17	CWDTC005	0-1
Thorium-228	pCi/g	0.69	CWDTC006	0-1
Thorium-230	pCi/g	0.51	CWDTC008	0-1
Thorium-232	pCi/g	0.51	CWDTC006	0-1
Thorium-234	pCi/g	0.86	CWDTC005	0-1
Uranium-233/234	pCi/g	0.47	CWDTC006	0-1
Uranium-235	pCi/g	0.04	CWDTC005	0-1
Uranium-238	pCi/g	0.50	CWDTC006	0-1
VOCs				
Methylene Chloride	µg/kg	4.20	CWDTC022	0-1
Toluene	µg/kg	0.54	CWDTC022	0-1
STOCKPILE C4				
METALS				
Antimony	mg/kg	0.36	CWDTC023	1-2
Arsenic	mg/kg	8.10	CWDTC023	1-2
Barium	mg/kg	166.00	CWDTC023	1-2
Beryllium	mg/kg	0.41	CWDTC023	1-2
Chromium	mg/kg	139.00	CWDTC023	1-2
Cobalt	mg/kg	21.60	CWDTC023	1-2
Copper	mg/kg	36.10	CWDTC023	1-2
Iron	mg/kg	33700.00	CWDTC023	1-2
Lead	mg/kg	7.50	CWDTC023	1-2
Manganese	mg/kg	605.00	CWDTC023	1-2
Mercury	mg/kg	1.10	CWDTC023	1-2
Molybdenum	mg/kg	0.36	CWDTC023	1-2
Nickel	mg/kg	244.00	CWDTC023	1-2
Selenium	mg/kg	2.20	CWDTC023	1-2
Thallium	mg/kg	1.70	CWDTC023	1-2
Vanadium	mg/kg	61.50	CWDTC023	1-2
Zinc	mg/kg	66.80	CWDTC023	1-2
PESTICIDES				
alpha-Chlordane	µg/kg	16000.00	CWDTC010	1-2
Chlordane	µg/L	240.00	TCLP-chlordane	1-2
gamma-Chlordane	µg/kg	18100.00	CWDTC010	1-2
Heptachlor	µg/kg	5370.00	CWDTC009	1-2

Table A1. Summary of Constituents Detected in Chlordane Stockpile Generated from the Southwest Trenches Area Removal Action (continued)

Constituent	Units	Maximum Concentration	Sample Identification of Maximum Concentration	Composite Sample Depth Range (ft bgs)
RADIONUCLIDES				
Actinium-228	pCi/g	0.57	CWDTC012	1-2
Americium-241	pCi/g	0.00	CWDTC010	1-2
Carbon-14	pCi/g	0.13	CWDTC011	1-2
Cesium-137	pCi/g	0.03	CWDTC012	1-2
Lead-210	pCi/g	2.83	CWDTC009	1-2
Lead-212	pCi/g	0.62	CWDTC013	1-2
Potassium-40	pCi/g	14.10	CWDTC010	1-2
Radium-226	pCi/g	0.58	CWDTC011	1-2
Thallium-208	pCi/g	0.18	CWDTC010	1-2
Thorium-228	pCi/g	0.58	CWDTC012	1-2
Thorium-230	pCi/g	0.68	CWDTC013	1-2
Thorium-232	pCi/g	0.57	CWDTC013	1-2
Thorium-234	pCi/g	1.49	CWDTC009	1-2
Uranium-233/234	pCi/g	0.43	CWDTC010	1-2
Uranium-235	pCi/g	0.04	CWDTC009	1-2
Uranium-238	pCi/g	0.46	CWDTC012	1-2
VOCs				
Methylene Chloride	µg/kg	5.40	CWDTC023	1-2
Toluene	µg/kg	1.00	CWDTC023	1-2
STOCKPILE C5				
GENERAL CHEMISTRY				
Cyanide, Reactive	mg/kg	0.38	CWDTC025	2-3.5
Paint Filter Test		pass	CWDTC025	2-3.5
Sulfide, Reactive	mg/kg	0.07	CWDTC025	2-3.5
METALS				
Antimony	mg/kg	0.42	CWDTC025	2-3.5
Arsenic	mg/kg	6.20	CWDTC025	2-3.5
Barium	mg/kg	139.00	CWDTC025	2-3.5
Beryllium	mg/kg	0.31	CWDTC025	2-3.5
Chromium	mg/kg	104.00	CWDTC025	2-3.5
Cobalt	mg/kg	17.00	CWDTC025	2-3.5
Copper	mg/kg	28.50	CWDTC025	2-3.5
Iron	mg/kg	25600.00	CWDTC025	2-3.5
Lead	mg/kg	5.30	CWDTC025	2-3.5
Manganese	mg/kg	477.00	CWDTC025	2-3.5
Mercury	mg/kg	1.80	CWDTC025	2-3.5
Molybdenum	mg/kg	0.19	CWDTC025	2-3.5
Nickel	mg/kg	190.00	CWDTC025	2-3.5
Selenium	mg/kg	1.30	CWDTC025	2-3.5
Thallium	mg/kg	0.82	CWDTC025	2-3.5
Vanadium	mg/kg	45.40	CWDTC025	2-3.5
Zinc	mg/kg	51.60	CWDTC025	2-3.5

Table A1. Summary of Constituents Detected in Chlordane Stockpile Generated from the Southwest Trenches Area Removal Action (continued)

Constituent	Units	Maximum Concentration	Sample Identification of Maximum Concentration	Composite Sample Depth Range (ft bgs)
PESTICIDES				
alpha-Chlordane	µg/kg	52200.00	CWDTC017	2-3.5
Chlordane	µg/L	114.00	TCLP-chlordane	2-3.5
gamma-Chlordane	µg/kg	71200.00	CWDTC017	2-3.5
Heptachlor	µg/kg	29900.00	CWDTC017	2-3.5
RADIONUCLIDES				
Actinium-228	pCi/g	0.57	CWDTC015	2-3.5
Cesium-137	pCi/g	0.02	CWDTC014	2-3.5
Lead-210	pCi/g	0.75	CWDTC014	2-3.5
Lead-212	pCi/g	0.63	CWDTC016	2-3.5
Potassium-40	pCi/g	13.90	CWDTC016	2-3.5
Radium-226	pCi/g	0.56	CWDTC019	2-3.5
Thallium-208	pCi/g	0.19	CWDTC016	2-3.5
Thorium-228	pCi/g	0.54	CWDTC014	2-3.5
Thorium-230	pCi/g	0.51	CWDTC015	2-3.5
Thorium-232	pCi/g	0.53	CWDTC017	2-3.5
Thorium-234	pCi/g	0.91	CWDTC019	2-3.5
Uranium-233/234	pCi/g	0.45	CWDTC014	2-3.5
Uranium-235	pCi/g	0.04	CWDTC016	2-3.5
Uranium-238	pCi/g	0.50	CWDTC017	2-3.5
STOCKPILE C5				
SVOCs				
Dimethyl Phthalate	µg/kg	44.00	CWDTC025	2-3.5
VOCs				
Methylene Chloride	µg/kg	3.40	CWDTC025	2-3.5
Toluene	µg/kg	2.60	CWDTC025	2-3.5
Trichloroethene	µg/kg	0.87	CWDTC025	2-3.5
STOCKPILE C6				
PESTICIDES				
alpha-Chlordane	µg/kg	519.00	CWDTC004	0-3.5
Chlordane	µg/L	11.80	TCLP-chlordane	0-3.5
gamma-Chlordane	µg/kg	619.00	CWDTC004	0-3.5
Heptachlor	µg/kg	123.00	CWDTC004	0-3.5
RADIONUCLIDES				
Actinium-228	pCi/g	0.51	CWDTC004	0-3.5
Cesium-137	pCi/g	0.02	CWDTC003	0-3.5
Lead-210	pCi/g	0.93	CWDTC004	0-3.5
Lead-212	pCi/g	0.58	CWDTC004	0-3.5
Potassium-40	pCi/g	11.90	CWDTC003	0-3.5
Radium-226	pCi/g	0.50	CWDTC003	0-3.5
Strontium-90	pCi/g	0.03	CWDTC003	0-3.5
Thallium-208	pCi/g	0.19	CWDTC004	0-3.5
Thorium-228	pCi/g	0.55	CWDTC003	0-3.5

Table A1. Summary of Constituents Detected in Chlordane Stockpile Generated from the Southwest Trenches Area Removal Action (continued)

Constituent	Units	Maximum Concentration	Sample Identification of Maximum Concentration	Composite Sample Depth Range (ft bgs)
Thorium-230	pCi/g	0.54	CWDTC003	0-3.5
Thorium-232	pCi/g	0.49	CWDTC003	0-3.5
Thorium-234	pCi/g	0.68	CWDTC004	0-3.5
Tritium	pCi/g	1.20	CWDTC003	0-3.5
Uranium-233/234	pCi/g	0.47	CWDTC004	0-3.5
Uranium-235	pCi/g	0.04	CWDTC003	0-3.5
Uranium-238	pCi/g	0.47	CWDTC004	0-3.5
RINSEATE BLANK				
Barium	mg/L	1.30	CWDTC027	NA
Beryllium	mg/L	0.17	CWDTC027	NA
Copper	mg/L	5.40	CWDTC027	NA
Iron	mg/L	38.70	CWDTC027	NA
Lead	mg/L	2.10	CWDTC027	NA
Manganese	mg/L	6.30	CWDTC027	NA
Molybdenum	mg/L	2.00	CWDTC027	NA
Nickel	mg/L	3.00	CWDTC027	NA
Thallium	mg/L	4.10	CWDTC027	NA
Zinc	mg/L	12.20	CWDTC027	NA
Americium-241	pCi/L	0.06	CWDTC027	NA
Thorium-228	pCi/L	1.17	CWDTC027	NA
Radium-226	pCi/L	0.32	CWDTC027	NA
EthylBenzene	ug/L	0.43	CWDTC027	NA
Methylene Chloride	ug/L	1.60	CWDTC027	NA
Xylenes (Total)	ug/L	0.96	CWDTC027	NA

Abbreviations

ft bgs	feet below ground surface
mg/kg	milligrams per kilogram
picoCuries	per gram
SVOCs	semivolatile organic compounds
VOCs	volatile organic compounds
µg/kg	micrograms per kilogram
µg/L	micrograms per liter

Table A2. Summary of Maximum Detections of Constituents in B-25 Boxes Generated From the Southwest Trenches Area Removal Action

Constituent	Units	Maximum Concentration	Sample Identification of Maximum Concentration	Composite Sample Grid Range	Composite Sample Depth Range (ft bgs)
Northern Excavation					
Chromium	mg/kg	158	CWDTC059/60	W12, S3	4-6
2-Butanone	μg/kg	70.1	CWDTC060	W12, S3	4-6
Toluene	μg/kg	27.3	CWDTC060	W12, S3	4-6
Western Excavation					
Arsenic	mg/kg	8.5	CWDTC054	W8-8.9, S9-11	4-11
Antimony	mg/kg	2.3	CWDTC058/59	W10-11, S7-10/W7, S8	0-5
Barium	mg/kg	200	CWDTC054	W8-8.9, S9-11	4-11
Beryllium	mg/kg	0.43	CWDTC054	W8-8.9, S9-11	4-11
Cadmium	mg/kg	0.79	CWDTC032	W10-10.7, S6.8-8	3-12
Chromium, Hexavalent	mg/kg	0.799	CWDTC036	W8-11, S6-8	5-14
Cobalt	mg/kg	22.8	CWDTC059	W7, S8	5
Copper	mg/kg	55.3	CWDTC028	W9.8-10.1, S8.4-9.5	5-11.5
Iron	mg/kg	34400	CWDTC054	W8-8.9, S9-11	4-11
Lead	mg/kg	44.6	CWDTC053	W8, S11	6-11
Manganese	mg/kg	734	CWDTC054	W8-8.9, S9-11	4-11
Mercury	mg/kg	1.3	CWDTC036	W8-11, S6-8	5-14
Molybdenum	mg/kg	0.52	CWDTC053	W8-8.8, S10.5-11.3	6-11
Nickel	mg/kg	270	CWDTC059	W7, S8	5
Silver	mg/kg	0.63	CWDTC052	W7.7-10.2, S11.5-13	3-11
Thallium	mg/kg	0.46	CWDTC053	W8, S11	6-11
Vanadium	mg/kg	60.2	CWDTC040	W9-10.4, S9.5-13	0-12
Zinc	mg/kg	153	CWDTC054	W8-8.9, S9-11	4-11
alpha-Chlordane	μg/kg	715	CWDTC051	W9.4-10.5, S11.7-13	3-11
Endosulfan I	μg/kg	110	CWDTC051DL1	W9.4-10.5, S11.7-13	3-11
gamma-Chlordane	μg/kg	654	CWDTC051	W9.4-10.5, S11.7-13	3-11
Heptachlor	μg/kg	262	CWDTC051	W9.4-10.5, S11.7-13	3-11
Heptachlor Epoxide	μg/kg	17.1	CWDTC053	W8, S11	6-11
Actinium-228	pCi/g	0.628	CWDTC032	W10-10.7, S6.8-8	3-12
Americium-241	pCi/g	0.0134	CWDTC053	W8, S11	6-11
Carbon-14	pCi/g	0.325	CWDTC040	W9-10.4, S9.5-13	0-12
Cesium-137	pCi/g	0.0695	CWDTC028	W9.8-10.1, S8.4-9.5	5-11.5
Lead-210	pCi/g	2.02	CWDTC028	W9.8-10.1, S8.4-9.5	5-11.5
Lead-212	pCi/g	0.599	CWDTC036	W8-11, S6-8	5-14
Lead-214	pCi/g	2.66	CWDTC028	W9.8-10.1, S8.4-9.5	5-11.5
Plutonium-241	pCi/g	0.384	CWDTC059	W7, S8	5
Potassium-40	pCi/g	13.6	CWDTC058	W10-11, S7-10	0-4.5
Radium-226	pCi/g	2.34	CWDTC028	W9.8-10.1, S8.4-9.5	5-11.5
Strontium-90	pCi/g	8.71	CWDTC055	W8-8.9, S9-11	4-11
Thallium-208	pCi/g	0.209	CWDTC059	W7, S8	5
Thorium-228	pCi/g	0.662	CWDTC055	W8-8.9, S9-11	4-11
Thorium-230	pCi/g	0.565	CWDTC058	W10-11, S7-10	0-4.5
Thorium-232	pCi/g	0.529	CWDTC032	W10-10.7, S6.8-8.8	3-12
Thorium-234	pCi/g	1.03	CWDTC052	W7.7-10.2, S11.5-13	3-11
Tritium	pCi/g	0.875	CWDTC028	W9.8-10.1, S8.4-9.5	5-11.5
Uranium-233/234	pCi/g	0.534	CWDTC055	W8-8.9, S9-11	4-11
Uranium-235	pCi/g	0.0778	CWDTC053	W8, S11	6-11
Uranium-238	pCi/g	0.505	CWDTC052	W7.7-10.2, S11.5-13	3-11
Chloroform	μg/kg	21.8	CWDTC032	W10-10.7, S6.8-8.8	3-12
EthylBenzene	μg/kg	0.8	CWDTC053	W8, S11	6-11
Xylenes (Total)	μg/kg	9.9	CWDTC053	W8, S11	6-11

Table A2. Summary of Maximum Detections of Constituents in B-25 Boxes Generated From the Southwest Trenches Area Removal Action (continued)

Constituent	Units	Maximum Concentration	Sample Identification of Maximum Concentration	Composite Sample Grid Range	Composite Sample Depth Range (ft bgs)
Nitrogen, Nitrate	mg/kg	1320	CWDTC055	W8-8.9, S9-11	4-11
Southern Excavation					
Aluminum	mg/kg	17600	CWDTC071	W3.5, S14	2-5
Antimony	mg/kg	1.6	CWDTC062		
Arsenic	mg/kg	8.8	CWDTC071	W3.5, S14	2-5
Barium	mg/kg	186	CWDTC067	W3.8, S13.8	3-4
Beryllium	mg/kg	0.43	CWDTC068	W5, S14.2	5-6
Calcium	mg/kg	5180	CWDTC074	W4, S14.2	3-6
Chromium	mg/kg	204	CWDTC072	W2.5, S14	2-4
Chromium, Hexavalent	mg/kg	0.462	CWDTC065	W14, S14	0-4
Cobalt	mg/kg	23.9	CWDTC062		
Copper	mg/kg	42.3	CWDTC069	W4, S14.2	3-6
Iron	mg/kg	36200	CWDTC071	W3.5, S14	2-5
Lead	mg/kg	9.9	CWDTC067	W3.8, S13.8	3-4
Magnesium	mg/kg	30000	CWDTC066	W4.5, S13.7	2-6
Manganese	mg/kg	904	CWDTC067	W3.8, S13.8	3-4
Mercury	mg/kg	2.2	CWDTC069	W4, S14.2	3-6
Nickel	mg/kg	314	CWDTC066	W4.5, S13.7	2-6
Potassium	mg/kg	1570	CWDTC071	W3.5, S14	2-5
Selenium	mg/kg	2.9	CWDTC062		
Silver	mg/kg	0.56	CWDTC072	W2.5, S14	2-4
Sodium	mg/kg	468	CWDTC072	W2.5, S14	2-4
Vanadium	mg/kg	64.8	CWDTC071	W3.5, S14	2-5
Zinc	mg/kg	105	CWDTC074	W4,S14.2	3-6
alpha-Chlordane	mg/kg	394	CWDTC067DL1	W3.8, S13.8	3-4
gamma-Chlordane	mg/kg	385	CWDTC067DL1	W3.8, S13.8	3-4
Actinium-228	pCi/g	0.661	CWDTC072	W2.5, S14	2-4
Americium-241	pCi/g	0.0888	CWDTC068	W5,S14.2	5-6
Carbon-14	pCi/g	177	CWDTC064	W3.5, S15	2-4
Cesium-137	pCi/g	176	CWDTC068	W5,S14.2	5-6
Lead-210	pCi/g	4.61	CWDTC064	W3.5, S15	2-4
Lead-212	pCi/g	0.627	CWDTC071	W3.5, S14	2-5
Plutonium-241	pCi/g	0.557	CWDTC068	W5,S14.2	5-6
Potassium-40	pCi/g	13	CWDTC071	W3.5, S14	2-5
Radium-226	pCi/g	0.557	CWDTC071	W3.5, S14	2-5
Strontium-90	pCi/g	0.603	CWDTC074	W4,S14.2	3-6
Thallium-208	pCi/g	0.193	CWDTC069	W4, S14.2	3-6
Thorium-228	pCi/g	0.723	CWDTC068	W5,S14.2	5-6
Thorium-230	pCi/g	0.595	CWDTC068	W5,S14.2	5-6
Thorium-232	pCi/g	0.535	CWDTC068	W5,S14.2	5-6
Thorium-234	pCi/g	1.17	CWDTC073	W1.8, S13.8	6-8
Uranium-233/234	pCi/g	0.429	CWDTC073	W1.8, S13.8	6-8
Uranium-235	pCi/g	0.0373	CWDTC068	W5,S14.2	5-6
Uranium-238	pCi/g	0.411	CWDTC068	W5,S14.2	5-6
Bis(2-Ethylhexyl)phthalate	μg/kg	192	CWDTC069	W4, S14.2	3-6
Benzene	μg/kg	0.0546	CWDTC064	W3.5, S15	2-4
Chlorodibromomethane	μg/kg	0.56	CWDTC065	W14, S14	0-4
Chloroform	μg/kg	1.27	CWDTC064	W3.5, S15	2-4
Dichlorobromomethane	μg/kg	0.774	CWDTC066	W4.5, S13.7	2-6
EthylBenzene	μg/kg	0.202	CWDTC066	W4.5, S13.7	2-6

Table A2. Summary of Maximum Detections of Constituents in B-25 Boxes Generated From the Southwest Trenches Area Removal Action (continued)

Constituent	Units	Maximum Concentration	Sample Identification of Maximum Concentration	Composite Sample Grid Range	Composite Sample Depth Range (ft bgs)
Methylene Chloride	µg/kg	68.2	CWDTC056	W6.5-13, S1-14	0-8
Toluene	µg/kg	2.91	CWDTC066	W4.5, S13.7	2-6
Xylenes (Total)	µg/kg	44.3	CWDTC070	W4, S13.5	1-3
Nitrogen, Nitrate	mg/kg	40.4	CWDTC071	W3.5, S14	2-5
Miscellaneous Waste Characterization					
Cyanide, Reactive	mg/kg	0.267	CWDTC032	W10-10.7, S6.8-8	3-12
Formaldehyde	mg/kg	6.12	CWDTC071	W3.5, S14	2-5
Nitrogen, Ammonia	mg/kg	95	CWDTC053	W8, S11	6-11
Nitrogen, Total Kjeldahl	mg/kg	591	CWDTC032	W10-10.7, S6.8-8	3-12
Sulfide, Reactive	mg/kg	10.9	CWDTC051	W9.4-10.5, S11.7-13	3-11
Total Organic Carbon	mg/kg	27800	CWDTC055	W8, S11	6-11
Paint Filter Test		Pass			

Abbreviations

ft bgs feet below ground surface
mg/kg milligrams per kilogram
pCi/g picoCuries per gram
µg/kg micrograms per kilogram

APPENDIX B

FIELD VS. LABORATORY ANALYTICAL RESULTS EVALUATION

FIELD VERSUS LABORATORY ANALYTICAL RESULTS EVALUATION

The following section evaluates the field analytical methods used during the Removal Action (RA) by comparing the field data with verification analytical results from an offsite laboratory. Field analytical methods were used to test soil samples for chlordane, Radium-226 (Ra-226) and Strontium-90 (Sr-90). Chlordane field versus laboratory results are discussed in this Appendix. The Ra-266 and Sr-90 field analytical methods were qualitative and cannot be compared to a laboratory analytical method.

B.1 Immunoassay-Based Chlordane Analytical Results

EPA Method 4041, immunoassay-based field analysis for chlordane, was utilized to test soil samples onsite during the RA. Millipore Envirogard test kits were used to test soil samples at three standards: 160, 800, and 2400 parts per billion (ppb). The field results were used to delineate the lateral and vertical extent of chlordane and determine whether excavation was required in a given location. In addition, field results confirmed whether the chlordane screening cleanup goal in a particular excavation had been reached, and whether confirmation samples could be collected and sent to an offsite laboratory for analysis. A total of 329 samples were analyzed using the field test kits.

As part of the Quality Assurance/Quality Control (QA/QC) program, duplicate analyses were performed using the field test method to determine the precision of the test kits. Duplicate analyses were performed at a rate of at least 10%. A total of 40 duplicate analyses were performed using the test kits and only two sets of analyses disagreed. Specifically, samples SSDTF171 and SSDTF176 were in the 160-800 ppb range, with duplicates of <160 ppb. This difference was due to rounding error on the photometer and appears to be insignificant.

As part of the QA/QC program, replicate samples were sent to an offsite laboratory for verification of the field results as a measure of accuracy of the test kits. The replicate samples were analyzed at an off-site laboratory for chlordane using EPA Method 8080. A total of 57 samples, or 25.5%, were verified by the offsite laboratory. Table B-1 presents the field and laboratory chlordane analytical results.

Laboratory analytical results were compared to the field results and the number of "False Positive" (FP) and "False Negative" (FN) results were determined. A FP was defined as a field result greater than the standard (i.e. 160, 800, 2400) with laboratory verification result less than the standard. Similarly, a FN was defined as a field result less than the standard and a laboratory result greater than the standard. A FP result would indicate that potentially "clean" soil was over-excavated, while a FN result would mean that potentially "contaminated" soil was left un-excavated. The desired outcome for the field test kits is to reduce the FN rate, which will, by default, increase the FP rate.

Table B-2 presents the FP and FN rates for each standard. The FN rates were 0% for all standards except for 160 ppb where there was one FN value. On the other hand, FP rates ranged from zero to 68%. The high false positive rate is partially due to the bias designed into the test kits by the manufacturer in order to reduce the FN rates. These data indicate that there is a high confidence (98%) that the contaminated soil was excavated. However, it is likely that some additional clean soil may have also been excavated as part of the RA based on the FP rate.

APPENDIX C

SOIL CONFIRMATION RESULTS

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC020				SSDTC021				SSDTC022				SSDTC024			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.556		0.157	0.0949	0.468		0.146	0.0995	0.412		0.13	0.0863	0.392		0.12	0.0795
Americium-241	0.000671		0.00222	0.0234	0.0155		0.0116	0.0196	0.00531		0.00714	0.0185	-0.00308		0.0875	0.0254
Bismuth-212	0.368		0.215	0.216	0.577		0.27	0.214	0.508		0.179	0.169	0.415		0.199	0.159
Bismuth-214	0.508		0.0898	0.0494	0.549		0.103	0.0515	0.437		0.0835	0.0417	0.399		0.0693	0.0409
Carbon-14	0.331		0.114	0.179	0.625		0.122	0.174	3		0.176	0.161	5.84		0.25	0.19
Cesium-137	-0.028		0.021	0.0275	-0.00298		0.0172	0.0284	0.00252		0.0129	0.0228	0.00761		0.0132	0.024
Cobalt-60	-0.00685		0.0192	0.0324	-0.00315		0.0172	0.0293	0.000415		0.0142	0.0255	0.00277		0.014	0.0257
Gross Alpha	5.1		1.65	2.06	6.69		3.38	3.59	6.76		3.44	3.91	6.01		3.3	4.21
Lead-210	1.16		1.51	2.35	1.57		1.78	2.81	2.03		1.5	2.42	2.45		4.27	6.92
Lead-212	0.555		0.0739	0.0384	0.63		0.0848	0.0469	0.433		0.062	0.0384	0.434		0.0623	0.0327
Lead-214	0.648		0.104	0.0478	0.61		0.104	0.0514	0.529		0.0926	0.0421	0.506		0.0847	0.0425
Nonvolatile Beta	14.7		2.05	2.76	10.4		3.54	5.79	13.8		3.87	5.81	14		3.89	6.09
Plutonium-241	0.517		0.268	0.386	0.153		0.233	0.34	0.115		0.23	0.36	0.247		0.214	0.332
Potassium-40	13		1.55	0.263	12.3		1.59	0.3	10		1.31	0.267	9.85		1.36	0.185
Radium-223	-0.223		0.327	0.456	0		0.25	0.487	0.00597		0.262	0.393	-0.0693		0.228	0.384
Radium-226	0.565		0.0846	0.0304	0.556		0.0929	0.0352	0.448		0.0778	0.0365	0.459		0.106	0.056
Radium-228	0.556		0.157	0.0949	0.468		0.146	0.0995	0.412		0.13	0.0863	0.392		0.12	0.0795
Strontium-90	15.7		0.701	0.275	0.000107		0.0215	0.03	-0.00106		0.0323	0.0451	0.0712		0.0736	0.101
Thallium-208	0.184		0.0447	0.0281	0.148		0.0339	0.0272	0.134		0.0292	0.0228	0.131		0.0324	0.0193
Thorium-228	0.486		0.159	0.101	0.432		0.171	0.139	0.429		0.151	0.104	0.509		0.163	0.11
Thorium-230	0.492		0.159	0.0943	0.323		0.132	0.0591	0.406		0.142	0.0751	0.455		0.146	0.0777
Thorium-232	0.361		0.126	0.046	0.37		0.145	0.0591	0.324		0.122	0.0682	0.297		0.109	0.0441
Thorium-234	0.505		0.838	0.775	0.0665		0.878	0.853	0.605		0.773	0.7	1.54		1.32	1.02
Tritium	0.214		0.449	0.763	-0.167		0.436	0.759	0.289		0.532	0.901	0.283		0.452	0.764
Uranium-233/234	0.401		0.066	0.00557	0.38		0.0623	0.0132	0.382		0.0716	0.0263	0.406		0.0709	0.0204
Uranium-235	0.0261		0.0141	0.00559	0.0191		0.0116	0.0052	0.0249		0.0166	0.0168	0.0194		0.0144	0.0164
Uranium-238	0.44		0.0704	0.0141	0.363		0.0602	0.00519	0.337		0.0659	0.0207	0.335		0.0631	0.0236
Weight of Sample, A&B	39			0	37			0	36.9			0	37.1			0
Weight of Sample, SR-90	29.7			0	6.3			0	37.3			0	29.2			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC025				SSDTC026				SSDTC027				SSDTC028			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.507		0.138	0.0773	0.425		0.123	0.0758	0.468		0.142	0.0736	0.383		0.11	0.0673
Americium-241	0.0378		0.0152	0.0165	0.00244		0.00512	0.0212	0.000501		0.00131	0.0179	0.00732		0.0103	0.0241
Bismuth-212	0.365		0.215	0.165	0.249		0.156	0.175	0.266		0.164	0.159	0.336		0.138	0.139
Bismuth-214	0.485		0.0803	0.0401	0.448		0.0792	0.0425	0.453		0.0736	0.0391	0.419		0.0776	0.0335
Carbon-14	0.36		0.108	0.164	1.01		0.129	0.164	0.289		0.118	0.186	4.32		0.234	0.203
Cesium-137	-0.00185		0.0129	0.0227	0.000485		0.0129	0.0228	0.0219		0.0274	0.0207	0.0251		0.0221	0.0186
Cobalt-60	-0.0117		0.0135	0.0225	0.00484		0.0148	0.0274	0.00618		0.0134	0.0251	0.00693		0.011	0.0211
Gross Alpha	8.03		4.37	7.12	8.08		3.84	4.86	4.33		2.82	4.21	6.32		2.14	2.44
Lead-210	1.38		1.45	2.53	1.37		2.62	2.9	0.681		3.89	4.21	0.376		0.222	0.194
Lead-212	0.469		0.0647	0.0342	0.442		0.0601	0.0312	0.486		0.0635	0.0326	0.471		0.0636	0.0226
Lead-214	0.598		0.0949	0.039	0.514		0.084	0.0399	0.465		0.0783	0.0404	0.515		0.0753	0.0311
Nonvolatile Beta	9.99		3.72	6.66	9.09		3.81	7.1	8.99		3.38	5.97	12		2.44	3.75
Plutonium-241	0.0419		0.247	0.363	0.16		0.244	0.356	-0.0504		0.194	0.333	0.0432		0.255	0.374
Potassium-40	9.96		1.17	0.216	10.6		1.3	0.213	11.1		1.29	0.175	10.2		1.07	0.168
Radium-223	-0.0873		0.23	0.385	-0.0608		0.23	0.389	0.162		0.23	0.401	0.0583		0.164	0.295
Radium-226	0.486		0.0737	0.0271	0.474		0.0692	0.021	0.494		0.0752	0.0306	0.438		0.0646	0.0249
Radium-228	0.507		0.138	0.0773	0.425		0.123	0.0758	0.468		0.142	0.0736	0.383		0.11	0.0673
Strontium-90	0.0161		0.0349	0.0484	-0.00219		0.0173	0.0242	-0.0343		0.0312	0.0442	0.0175		0.0388	0.0538
Thallium-208	0.138		0.0292	0.0219	0.128		0.0338	0.0213	0.131		0.0281	0.022	0.148		0.0286	0.0193
Thorium-228	0.374		0.117	0.0786	0.478		0.178	0.141	0.46		0.19	0.142	0.577		0.183	0.121
Thorium-230	0.433		0.124	0.0421	0.435		0.157	0.0565	0.325		0.148	0.108	0.28		0.109	0.0651
Thorium-232	0.214		0.0779	0.0165	0.372		0.141	0.0565	0.297		0.139	0.0978	0.35		0.125	0.0572
Thorium-234	0.459		0.674	0.737	0.985		0.894	0.749	1.44		1.06	0.784	0.367		0.283	0.239
Tritium	0.345		0.523	0.883	0.506		0.445	0.742	0.238		0.451	0.764	0.00765		0.444	0.763
Uranium-233/234	0.378		0.137	0.127	0.364		0.0713	0.0254	0.402		0.0747	0.0175	0.441		0.0806	0.0304
Uranium-235	0.0359		0.0362	0.0269	0.0207		0.0148	0.00777	0.0369		0.0212	0.0217	0.0103		0.0104	0.00774
Uranium-238	0.322		0.114	0.0268	0.313		0.0646	0.0179	0.316		0.0644	0.0175	0.303		0.063	0.00771
Weight of Sample, A&B	42.5			0	35.7			0	36			0	33.4			0
Weight of Sample, SR-90	30.4			0	7.8			0	5.2			0	32.4			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC029				SSDTC030				SSDTC031				SSDTC032			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.435		0.118	0.0758	0		0.187	0.237	0.532		0.145	0.0837	0.623		0.135	0.0895
Americium-241	0.0102		0.00891	0.0168	0.00282		0.00498	0.0184	0.00225		0.00517	0.0234	0.00541		0.00823	0.0227
Bismuth-212	0.544		0.19	0.163	0.376		0.288	0.359	0.282		0.152	0.185	0.287		0.197	0.184
Bismuth-214	0.483		0.0787	0.0398	0.588		0.132	0.077	0.455		0.0799	0.0456	0.515		0.0914	0.0477
Carbon-14	0.201		0.129	0.175	0.184		0.104	0.167	0.222		0.1	0.117	0.202		0.123	0.199
Cesium-137	0.00453		0.0122	0.0218	0.00517		0.0238	0.0423	0.0101		0.0228	0.0221	0.0894		0.0274	0.0248
Cobalt-60	0.00374		0.0219	0.0256	-0.0108		0.0236	0.0405	-0.00215		0.0158	0.0281	0.00246		0.0163	0.029
Gross Alpha	6.62		2.87	3.59	7.63		3.13	4.05	11.7		3.74	3.9	7.22		3.01	3.37
Lead-210	1.26		1.28	2.1	0.0224		2	2.29	1.13		1.56	2.44	0.875		2.25	2.04
Lead-212	0.492		0.0647	0.0306	0.529		0.0891	0.0569	0.453		0.0628	0.0337	0.624		0.0782	0.0337
Lead-214	0.501		0.0807	0.0392	0.545		0.124	0.0729	0.444		0.0792	0.0425	0.595		0.0936	0.0442
Nonvolatile Beta	16.5		3.79	6.2	11.9		3.26	5.42	17.8		3.27	4.31	16.6		3.36	4.8
Plutonium-241	0.0788		0.193	0.327	-0.00548		0.201	0.377	-0.0542		0.209	0.357	0.0407		0.209	0.329
Potassium-40	11.6		1.39	0.214	10.5		1.31	0.37	11.4		1.29	0.26	13.5		1.57	0.231
Radium-223	0.0594		0.251	0.384	-0.19		0.419	0.7	0.094		0.241	0.415	0.0868		0.284	0.431
Radium-226	0.515		0.0753	0.029	0.507		0.0683	0.026	0.438		0.0671	0.0313	0.685		0.093	0.0322
Radium-228	0.435		0.118	0.0758	0		0.187	0.237	0.532		0.145	0.0837	0.623		0.135	0.0895
Strontium-90	1.95		0.0551	0.0442	-0.00209		0.034	0.0474	0.182		0.034	0.043	-0.0708		0.0304	0.0442
Thallium-208	0.168		0.0365	0.0201	0.184		0.0589	0.0412	0.179		0.0358	0.0231	0.224		0.0448	0.0233
Thorium-228	0.686		0.265	0.213	0.573		0.202	0.158	0.461		0.188	0.152	0.455		0.213	0.17
Thorium-230	0.341		0.159	0.117	0.528		0.179	0.0569	0.397		0.166	0.124	0.416		0.197	0.146
Thorium-232	0.548		0.213	0.0935	0.442		0.159	0.0693	0.265		0.122	0.0318	0.38		0.191	0.174
Thorium-234	0.768		0.693	0.628	0.747		1.28	1.18	0.345		0.62	0.681	1.23		0.998	0.681
Tritium	-0.154		0.467	0.811	0.156		0.435	0.741	-0.0441		0.425	0.734	-0.0506		0.418	0.721
Uranium-233/234	0.395		0.0783	0.0335	0.4		0.0741	0.0317	0.421		0.081	0.0245	0.387		0.0695	0.0169
Uranium-235	0.03		0.0207	0.0244	0.00726		0.0126	0.0227	0.0172		0.0141	0.00858	0.029		0.0163	0.0067
Uranium-238	0.407		0.0793	0.0278	0.45		0.0782	0.00715	0.383		0.0769	0.0311	0.381		0.0685	0.00668
Weight of Sample, A&B	33.4			0	35.1			0	37.2			0	36.5			0
Weight of Sample, SR-90	31.5			0	4.2			0	34.6			0	4.6			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC033				SSDTC034				SSDTC035				SSDTC036			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.514		0.158	0.0901	0.476		0.127	0.0756	0.62		0.161	0.103	0.748		0.172	0.102
Americium-241	-0.00177		0.00989	0.0198	0.00376		0.0055	0.0177	0.00541		0.0076	0.0203	0.00921		0.00957	0.0202
Bismuth-212	0.472		0.199	0.197	0.315		0.141	0.168	0.29		0.222	0.2	0.761		0.222	0.204
Bismuth-214	0.393		0.0862	0.0521	0.389		0.0675	0.0418	0		0.105	0.119	0.536		0.0954	0.0566
Carbon-14	0.0807		0.0798	0.109	0.111		0.0779	0.106	0.139		0.0796	0.107	0.189		0.0771	0.0899
Cesium-137	0.0206		0.0179	0.0253	0.017		0.0229	0.0215	0.98		0.102	0.0295	1.18		0.123	0.0305
Cobalt-60	0.0139		0.0177	0.0323	-0.00336		0.0152	0.0229	0.0188		0.0202	0.0327	0.00854		0.0174	0.0325
Gross Alpha	5.46		2.63	3.07	6.75		2.93	3.29	7.15		2.97	3.52	7.56		3.2	4.19
Lead-210	1.38		1.6	2.58	0.907		3.03	2.11	0.461		5.89	8.89	2.2		1.92	3.2
Lead-212	0.557		0.0768	0.0376	0.499		0.0664	0.032	0.671		0.0904	0.0426	0.76		0.0967	0.0426
Lead-214	0.579		0.102	0.0469	0.543		0.0877	0.0366	0.64		0.107	0.0574	0.69		0.115	0.0537
Nonvolatile Beta	11.7		2.94	4.45	14.5		3.3	5.05	15.3		3.72	6.1	16.3		3.69	5.87
Plutonium-241	0.129		0.283	0.415	0.109		0.184	0.268	0.0822		0.231	0.339	0.277		0.218	0.316
Potassium-40	12.4		1.54	0.232	11		1.39	0.217	13.9		1.88	0.276	14.6		1.67	0.287
Radium-223	-0.135		0.262	0.444	0.104		0.231	0.375	-0.312		0.361	0.5	0.00845		0.358	0.531
Radium-226	0.474		0.0692	0.0324	0.442		0.0625	0.0246	0.625		0.0912	0.0319	0.703		0.108	0.0337
Radium-228	0.514		0.158	0.0901	0.476		0.127	0.0756	0.62		0.161	0.103	0.748		0.172	0.102
Strontium-90	0.118		0.0627	0.0847	0.114		0.0515	0.0693	0.000429		0.0167	0.0234	0.0899		0.049	0.0663
Thallium-208	0.173		0.0373	0.0257	0.157		0.0303	0.0206	0.227		0.0439	0.029	0.202		0.0388	0.0284
Thorium-228	0.476		0.197	0.147	0.536		0.206	0.167	0.632		0.309	0.181	0.568		0.252	0.175
Thorium-230	0.5		0.195	0.0892	0.423		0.164	0.0772	0.548		0.277	0.133	0.497		0.225	0.117
Thorium-232	0.477		0.187	0.0349	0.417		0.166	0.105	0.34		0.209	0.157	0.412		0.199	0.0562
Thorium-234	0.152		0.821	0.78	0.671		0.398	0.724	0.619		1.44	1.35	1		1.26	0.919
Tritium	-0.0531		0.439	0.757	0.165		0.438	0.746	-0.0172		0.495	0.853	0.133		0.432	0.736
Uranium-233/234	0.359		0.064	0.0243	0.424		0.0655	0.0316	0.496		0.0727	0.0268	0.46		0.0812	0.0243
Uranium-235	0.0161		0.0139	0.019	0.0127		0.0155	0.0244	0.021		0.0135	0.0157	0.0149		0.0122	0.00745
Uranium-238	0.427		0.0708	0.0152	0.359		0.0565	0.012	0.486		0.0703	0.00462	0.419		0.0767	0.027
Weight of Sample, A&B	33.9			0	33.2			0	36.8			0	37.3			0
Weight of Sample, SR-90	33.3			0	29.3			0	7.1			0	28.7			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC037				SSDTC038				SSDTC039				SSDTC040			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.452		0.103	0.0636	0.429		0.13	0.0934	0.477		0.124	0.0796	0.5		0.183	0.151
Americium-241	0.00867		0.0105	0.0235	0.00385		0.0059	0.0191	-0.00508		0.0324	0.0189	0.00546		0.00794	0.0205
Bismuth-212	0.35		0.158	0.134	0.39		0.224	0.205	0.278		0.153	0.167	0.267		0.435	0.327
Bismuth-214	0.387		0.0677	0.0341	0.48		0.0966	0.0484	0.459		0.0776	0.036	0.449		0.118	0.0824
Carbon-14	0.175		0.0772	0.0903	0.289		0.0976	0.15	0.0879		0.0777	0.106	0.137		0.0738	0.121
Cesium-137	0.0166		0.0233	0.0193	0.0159		0.0318	0.0253	0.0259		0.0152	0.0231	-0.0176		0.0265	0.0445
Cobalt-60	-0.00203		0.0102	0.0183	-0.00102		0.0156	0.0278	-0.00367		0.0127	0.0225	0.0349		0.0365	0.0438
Gross Alpha	5.27		2.65	3.57	7.66		2.15	1.73	5.06		2.67	3.75	8.71		2.37	2.33
Lead-210	0.903		4.26	3.8	0.261		0.294	0.259	0.128		2.99	2.84	1.54		2.5	2.24
Lead-212	0.552		0.0673	0.029	0.621		0.0835	0.0308	0.493		0.0646	0.0304	0.71		0.105	0.0572
Lead-214	0.49		0.0747	0.035	0.594		0.089	0.0452	0.466		0.0857	0.0368	0.677		0.133	0.0768
Nonvolatile Beta	7.76		3.04	5.64	11.2		2.4	3.76	8.07		3.31	6.27	15.3		2.58	3.79
Plutonium-241	0.00867		0.255	0.375	0.0994		0.203	0.297	0.302		0.218	0.396	0.386		0.21	0.344
Potassium-40	12.6		1.42	0.181	12.7		1.34	0.232	10.6		1.29	0.212	11.1		1.37	0.439
Radium-223	0.0463		0.191	0.338	0.19		0.234	0.406	-0.0394		0.208	0.355	-0.311		0.452	0.742
Radium-226	0.51		0.1	0.0534	0.601		0.0981	0.0446	0.442		0.0624	0.0267	0.613		0.119	0.057
Radium-228	0.452		0.103	0.0636	0.429		0.13	0.0934	0.477		0.124	0.0796	0.5		0.183	0.151
Strontium-90	0.036		0.0313	0.0427	0.00352		0.031	0.043	-0.0117		0.0388	0.0545	0.0933		0.0476	0.0643
Thallium-208	0.156		0.0318	0.0175	0.201		0.0415	0.0239	0.147		0.0311	0.02	0.224		0.0604	0.0414
Thorium-228	0.483		0.184	0.139	0.592		0.181	0.0937	0.336		0.161	0.148	0.484		0.224	0.225
Thorium-230	0.486		0.176	0.0747	0.504		0.158	0.0568	0.375		0.16	0.0351	0.327		0.165	0.155
Thorium-232	0.404		0.155	0.0613	0.489		0.155	0.0568	0.34		0.15	0.0351	0.51		0.208	0.0794
Thorium-234	0.587		0.904	0.774	0.669		0.37	0.288	0.808		0.732	0.723	1.28		1.39	1.27
Tritium	0.0674		0.436	0.747	0.00745		0.432	0.743	0.0669		0.433	0.741	1.78		0.61	0.972
Uranium-233/234	0.433		0.0704	0.0244	0.433		0.0861	0.0222	0.408		0.0679	0.00583	0.427		0.068	0.0262
Uranium-235	0.0238		0.0147	0.015	0.0233		0.0189	0.0223	0.0195		0.0125	0.00585	0.0261		0.0166	0.0201
Uranium-238	0.479		0.0746	0.0189	0.445		0.0877	0.0222	0.412		0.0685	0.0149	0.463		0.0707	0.0173
Weight of Sample, A&B	38.5			0	35.3			0	37.1			0	36.4			0
Weight of Sample, SR-90	4.1			0	5.2			0	31.5			0	29.1			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC041				SSDTC042				SSDTC043				SSDTC044			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.637		0.138	0.0868	0.585		0.141	0.0841	0.65		0.153	0.0861	0.678		0.143	0.0849
Americium-241	0.0229		0.0126	0.0162	0.029		0.0143	0.0167	0.000285		0.000732	0.0171	0.00594		0.0076	0.0187
Bismuth-212	0.404		0.179	0.18	0.563		0.217	0.172	0.328		0.183	0.195	0.551		0.224	0.181
Bismuth-214	0.579		0.097	0.0446	0.535		0.0891	0.0426	0		0.0896	0.104	0.532		0.096	0.0449
Carbon-14	0.3		0.0784	0.122	0.195		0.0699	0.111	0.0245		0.0689	0.117	-0.0212		0.0674	0.117
Cesium-137	-0.00295		0.0141	0.0246	0.00324		0.0139	0.0243	0.00314		0.015	0.0265	-0.00148		0.0143	0.025
Cobalt-60	0.000816		0.0138	0.0253	0.00419		0.0146	0.0263	0.00828		0.0161	0.03	0.0104		0.016	0.0303
Gross Alpha	6.82		3.1	4.06	7.24		3.02	3.38	3.84		2.3	3.1	6.43		2.93	3.41
Lead-210	1.38		1.66	2.91	1.97		1.24	2.09	4.77		4.86	7.85	2.69		1.73	2.97
Lead-212	0.637		0.0782	0.0324	0.641		0.0777	0.0321	0.692		0.0888	0.0351	0.711		0.0898	0.042
Lead-214	0.605		0.0927	0.0436	0.623		0.0936	0.0408	0.682		0.107	0.0438	0.67		0.106	0.0419
Nonvolatile Beta	15.7		3.26	4.57	16.3		3.37	4.85	16.5		3.2	4.3	10.6		3.02	5.01
Plutonium-241	0.286		0.178	0.293	0.29		0.176	0.29	0.126		0.175	0.296	0.297		0.17	0.278
Potassium-40	12.4		1.38	0.221	12.3		1.44	0.239	13.4		1.8	0.213	12.9		1.49	0.225
Radium-223	0.0291		0.272	0.415	-0.139		0.232	0.381	-0.00531		0.286	0.431	-0.0563		0.263	0.44
Radium-226	0.623		0.0853	0.0323	0.637		0.0852	0.0292	0.602		0.0823	0.0315	0.555		0.0766	0.0291
Radium-228	0.637		0.138	0.0868	0.585		0.141	0.0841	0.65		0.153	0.0861	0.678		0.143	0.0849
Strontium-90	0.0162		0.0143	0.0236	0.0075		0.0135	0.0227	0.0551		0.0321	0.0526	0.0497		0.0293	0.0478
Thallium-208	0.197		0.0416	0.0233	0.203		0.0402	0.0224	0.191		0.0416	0.0247	0.209		0.0393	0.0245
Thorium-228	0.602		0.232	0.159	0.686		0.233	0.144	0.366		0.204	0.211	0.5		0.226	0.208
Thorium-230	0.627		0.235	0.149	0.46		0.169	0.061	0.397		0.201	0.153	0.395		0.185	0.146
Thorium-232	0.501		0.195	0.0726	0.373		0.147	0.061	0.405		0.202	0.139	0.336		0.16	0.0832
Thorium-234	0.458		0.632	0.74	0.86		0.747	0.651	3.74		2.05	1.12	0.0975		0.755	0.855
Tritium	0.277		0.559	0.947	1.38		0.554	0.895	-0.0405		0.549	0.941	1.3		0.586	0.956
Uranium-233/234	0.437		0.0676	0.0276	0.513		0.0777	0.0213	0.456		0.0706	0.0142	0.476		0.0732	0.0248
Uranium-235	0.0254		0.0129	0.00477	0.0344		0.0161	0.00542	0.0204		0.0146	0.018	0.0311		0.015	0.00519
Uranium-238	0.477		0.0701	0.00476	0.441		0.0698	0.0146	0.471		0.0722	0.0142	0.48		0.0725	0.00517
Weight of Sample, A&B	35.5			0	35.8			0	38.9			0	37.9			0
Weight of Sample, SR-90	10.8			0	10.6			0	29.7			0	29.7			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC045				SSDTC046				SSDTC047				SSDTC048			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.56		0.145	0.0931	0.636		0.153	0.0858	0.713		0.147	0.0849	0.602		0.139	0.0736
Americium-241	0.00181		0.00367	0.018	0.0127		0.00922	0.0151	0.000569		0.00146	0.0182	0.00000135		4.37e-06	0.0197
Bismuth-212	0.242		0.192	0.224	0.623		0.209	0.186	0.462		0.199	0.183	0.316		0.18	0.152
Bismuth-214	0.549		0.0972	0.0461	0.541		0.0918	0.0447	0.64		0.11	0.0404	0.478		0.0778	0.041
Carbon-14	0.0243		0.0714	0.121	0.038		0.0722	0.123	-0.00784		0.0651	0.116	0.0345		0.0715	0.121
Cesium-137	-0.00532		0.0148	0.0254	0.0102		0.0311	0.0242	0.0145		0.0243	0.0264	-0.00359		0.0123	0.0206
Cobalt-60	-0.00451		0.0167	0.0293	-0.00198		0.0162	0.0287	0.00902		0.0149	0.028	-0.00394		0.0135	0.0225
Gross Alpha	7.56		3.08	3.02	7.63		3.02	3.21	7		3.08	3.65	8.74		3.26	3.12
Lead-210	2.55		3.99	3.33	0.7		4.18	5.1	0.552		0.273	0.241	0.191		1.03	0.99
Lead-212	0.607		0.0782	0.035	0.719		0.0873	0.0364	0.703		0.0924	0.0321	0.702		0.0838	0.0299
Lead-214	0.656		0.111	0.043	0.68		0.101	0.0479	0.671		0.0963	0.0427	0.651		0.0923	0.0368
Nonvolatile Beta	15.6		3.6	5.53	11.7		3.18	5.21	15.2		3.42	5.18	11.3		3.37	5.75
Plutonium-241	0.228		0.183	0.303	0.147		0.157	0.264	0.171		0.182	0.306	0.338		0.184	0.301
Potassium-40	13		1.57	0.247	15.1		1.72	0.237	12.9		1.35	0.216	14.2		1.51	0.199
Radium-223	-0.166		0.303	0.437	0.179		0.259	0.446	-0.186		0.259	0.375	0.269		0.236	0.338
Radium-226	0.65		0.0939	0.032	0.757		0.11	0.044	0.715		0.107	0.0291	0.632		0.0912	0.0359
Radium-228	0.56		0.145	0.0931	0.636		0.153	0.0858	0.713		0.147	0.0849	0.602		0.139	0.0736
Strontium-90	0.131		0.0259	0.0373	0.00432		0.0265	0.0454	-0.0126		0.0154	0.0273	-0.00322		0.023	0.0367
Thallium-208	0.188		0.0358	0.0233	0.195		0.0433	0.024	0.212		0.04	0.0228	0.21		0.035	0.0202
Thorium-228	0.633		0.24	0.165	0.46		0.201	0.171	0.455		0.216	0.17	0.554		0.259	0.194
Thorium-230	0.53		0.204	0.0884	0.615		0.232	0.104	0.612		0.255	0.123	0.541		0.247	0.141
Thorium-232	0.496		0.192	0.0346	0.532		0.208	0.0754	0.605		0.249	0.0422	0.452		0.214	0.0484
Thorium-234	0.746		0.772	0.832	0.789		1.16	0.927	0.693		0.378	0.302	0.306		0.526	0.502
Tritium	0.638		0.564	0.939	0.985		0.665	1.1	0.779		0.567	0.944	0.33		0.599	1.01
Uranium-233/234	0.454		0.0679	0.022	0.521		0.0748	0.0222	0.429		0.0675	0.0175	0.482		0.112	0.0801
Uranium-235	0.0224		0.0138	0.0156	0.013		0.0125	0.0183	0.0326		0.0153	0.00515	-0.00252		0.0227	0.0497
Uranium-238	0.474		0.0696	0.0181	0.445		0.0666	0.0157	0.483		0.0736	0.0226	0.425		0.0983	0.0495
Weight of Sample, A&B	36.9			0	37.5			0	38.9			0	37.6			0
Weight of Sample, SR-90	32			0	30.5			0	10.3			0	7.2			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC049				SSDTC050				SSDTC051				SSDTC052			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.64		0.168	0.0986	0.673		0.166	0.102	0.536		0.142	0.0878	0.684		0.142	0.0728
Americium-241	-0.000698		0.00252	0.0179	0.00981		0.00867	0.0166	0.0000157		5.42e-05	0.0208	0.000492		0.00159	0.022
Bismuth-212	0.35		0.195	0.212	0.498		0.217	0.203	0.318		0.177	0.171	0.446		0.262	0.155
Bismuth-214	0		0.0945	0.11	0.488		0.0885	0.0502	0.499		0.091	0.0441	0.535		0.0911	0.0408
Carbon-14	0.0282		0.0644	0.109	0.0966		0.0828	0.138	0.126		0.07	0.115	0.064		0.072	0.121
Cesium-137	0.0174		0.0185	0.029	-0.0114		0.0148	0.0243	-0.00718		0.014	0.0235	-0.000954		0.013	0.0191
Cobalt-60	0.00347		0.0188	0.0328	-0.00753		0.0172	0.0292	-0.00663		0.0178	0.0261	0.00575		0.014	0.0243
Gross Alpha	12.1		3.77	3.18	8.43		3.2	3.16	6.71		2.97	3.89	7.23		3.52	5.5
Lead-210	0.679		1.79	2.8	2.09		1.82	2.82	1.91		1.56	2.49	0.212		1.11	0.952
Lead-212	0.69		0.0894	0.0405	0.706		0.0904	0.0388	0.631		0.0821	0.0371	0.667		0.0804	0.0311
Lead-214	0.613		0.108	0.0488	0.619		0.101	0.0466	0.569		0.0938	0.0444	0.596		0.0846	0.0393
Nonvolatile Beta	12.4		3.56	6.13	15.1		3.47	5.34	10.4		3.1	5.34	17.7		3.61	5.31
Plutonium-241	0.29		0.198	0.327	0.345		0.202	0.331	0.113		0.166	0.281	0.122		0.191	0.323
Potassium-40	12.9		1.6	0.28	14		1.75	0.266	13.1		1.61	0.226	14.7		1.58	0.202
Radium-223	0.149		0.313	0.486	-0.183		0.335	0.475	-0.155		0.263	0.426	0.0589		0.242	0.363
Radium-226	0.596		0.0894	0.0364	0.68		0.0941	0.0448	0.559		0.0794	0.0304	0.673		0.0931	0.0461
Radium-228	0.64		0.168	0.0986	0.673		0.166	0.102	0.536		0.142	0.0878	0.684		0.142	0.0728
Strontium-90	-0.0256		0.019	0.0312	-0.0115		0.0192	0.0335	-0.0371		0.0179	0.0325	0.00787		0.0171	0.029
Thallium-208	0.233		0.0399	0.0233	0.225		0.0422	0.0253	0.212		0.0384	0.0221	0.2		0.0352	0.0196
Thorium-228	0.709		0.185	0.0891	0.629		0.197	0.114	0.616		0.221	0.133	0.433		0.189	0.149
Thorium-230	0.518		0.149	0.0763	0.679		0.203	0.096	0.496		0.183	0.0316	0.553		0.212	0.0903
Thorium-232	0.617		0.163	0.022	0.639		0.195	0.096	0.38		0.153	0.0316	0.388		0.17	0.113
Thorium-234	0.405		0.869	0.851	0.718		0.887	0.794	0.313		0.698	0.758	0.918		0.507	0.49
Tritium	0.564		0.63	1.06	0.225		0.616	1.05	-0.224		0.58	1	-0.0364		0.615	1.06
Uranium-233/234	0.537		0.0786	0.0222	0.487		0.077	0.0159	0.413		0.0666	0.0207	0.492		0.074	0.02
Uranium-235	0.0284		0.0195	0.0261	0.0386		0.02	0.0201	0.0179		0.0161	0.0231	0.0237		0.0129	0.00508
Uranium-238	0.46		0.0718	0.0308	0.477		0.0758	0.00589	0.375		0.0625	0.0207	0.448		0.0697	0.0223
Weight of Sample, A&B	38.2			0	37			0	39.6			0	42.5			0
Weight of Sample, SR-90	8.4			0	9.2			0	10.5			0	10.5			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC053				SSDTC054				SSDTC055				SSDTC056			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.473		0.12	0.0679	0.696		0.158	0.103	0.583		0.128	0.0634	0.502		0.112	0.0601
Americium-241	-0.00732		0.0278	0.0249	0.0015		0.00434	0.024	0.00846		0.00762	0.0152	-0.0081		0.039	0.0378
Bismuth-212	0.396		0.184	0.138	0.684		0.277	0.208	0.284		0.15	0.128	0.312		0.18	0.128
Bismuth-214	0.45		0.0748	0.035	0.587		0.101	0.0488	0.492		0.0746	0.0303	0.496		0.0741	0.0313
Carbon-14	0.1		0.0716	0.119	0.029		0.0661	0.112	0.0435		0.0676	0.115	0.0955		0.0718	0.12
Cesium-137	-0.0142		0.0108	0.0173	-0.0132		0.015	0.0247	-0.00231		0.0113	0.0168	-0.00366		0.00971	0.0166
Cobalt-60	0.00406		0.0121	0.0209	0.00569		0.0174	0.0321	0.00685		0.0111	0.0195	0.00375		0.0112	0.0194
Gross Alpha	7.25		2.74	1.69	7.35		2.98	3.39	6.65		2.86	3.34	6.74		3.3	5.24
Lead-210	0.931		1.38	0.884	1.81		1.64	3.03	0.276		0.776	0.812	0.404		0.991	0.831
Lead-212	0.57		0.0698	0.0281	0.671		0.087	0.0396	0.597		0.0708	0.0247	0.57		0.0686	0.0263
Lead-214	0.528		0.0758	0.034	0.616		0.104	0.0499	0.533		0.0795	0.0305	0.587		0.0799	0.0302
Nonvolatile Beta	10.3		2.95	4.86	11		3.09	4.99	10.4		3.12	5.32	10.7		3.25	5.67
Plutonium-241	0.136		0.183	0.308	0.166		0.214	0.36	0.215		0.196	0.328	0.144		0.183	0.308
Potassium-40	14.5		1.52	0.178	13.6		1.56	0.273	13.4		1.41	0.172	13.7		1.44	0.15
Radium-223	0.11		0.216	0.332	0.0516		0.294	0.496	-0.0258		0.194	0.295	-0.138		0.199	0.292
Radium-226	0.497		0.0729	0.0271	0.608		0.0979	0.0303	0.544		0.118	0.0579	0.575		0.0834	0.0292
Radium-228	0.473		0.12	0.0679	0.696		0.158	0.103	0.583		0.128	0.0634	0.502		0.112	0.0601
Strontium-90	0.00316		0.0195	0.0308	0.0123		0.0211	0.033	0.00154		0.0172	0.0295	-0.00958		0.019	0.033
Thallium-208	0.19		0.0335	0.0174	0.224		0.041	0.028	0.175		0.031	0.0157	0.178		0.033	0.0157
Thorium-228	0.528		0.162	0.0881	0.608		0.22	0.106	0.453		0.158	0.118	0.395		0.229	0.216
Thorium-230	0.4		0.133	0.0723	0.421		0.167	0.0324	0.469		0.154	0.059	0.373		0.212	0.161
Thorium-232	0.4		0.131	0.0439	0.518		0.192	0.0324	0.388		0.135	0.0485	0.244		0.162	0.138
Thorium-234	0.82		0.71	0.46	0.426		0.779	0.841	0.38		0.472	0.424	0.593		0.426	0.429
Tritium	-0.0406		0.552	0.944	-0.329		0.61	1.06	0.517		0.585	0.985	-0.143		0.603	1.04
Uranium-233/234	0.357		0.068	0.0274	0.435		0.0724	0.0165	0.422		0.0742	0.0263	0.33		0.0633	0.0259
Uranium-235	0.013		0.0154	0.0237	0.0159		0.0133	0.0165	0.0259		0.0185	0.0228	0.0242		0.0148	0.0066
Uranium-238	0.333		0.0642	0.0187	0.38		0.0664	0.0165	0.403		0.0714	0.018	0.398		0.0707	0.0224
Weight of Sample, A&B	41.7			0	38			0	38.5			0	38.2			0
Weight of Sample, SR-90	9.2			0	9			0	10.5			0	10			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC057				SSDTC058				SSDTC059				SSDTC060			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.704		0.159	0.0901	0.467		0.122	0.0741	0.562		0.145	0.0873	0.479		0.115	0.0771
Americium-241	-0.0014		0.00798	0.0211	0.00158		0.00292	0.0164	0.00694		0.00598	0.0115	-0.00255		0.0147	0.0118
Bismuth-212	0.385		0.186	0.218	0.251		0.185	0.169	0.21		0.274	0.183	0.268		0.176	0.161
Bismuth-214	0.508		0.0842	0.0462	0.464		0.0905	0.0395	0		0.0872	0.0992	0.488		0.0818	0.0388
Carbon-14	0.155		0.0717	0.118	0.0892		0.0712	0.118	0.0541		0.0648	0.109	0.0274		0.0702	0.119
Cesium-137	-0.00178		0.0145	0.0253	0.0268		0.0162	0.0206	-0.0116		0.0152	0.0244	0.0175		0.0154	0.0253
Cobalt-60	0.00402		0.0171	0.0312	0.0125		0.0145	0.0272	0.0163		0.0108	0.0282	0.00188		0.0242	0.0238
Gross Alpha	7.29		2.9	3.25	8.99		2.62	2.91	9.07		3.21	2.44	7.12		2.74	2.34
Lead-210	1.93		1.78	3.01	0.11		1.99	1.86	0.14		2.1	2.37	0.758		1.33	2.16
Lead-212	0.745		0.0932	0.0373	0.502		0.0658	0.0321	0.564		0.0738	0.0369	0.594		0.0743	0.0314
Lead-214	0.581		0.0991	0.0488	0.534		0.0872	0.0404	0.467		0.0838	0.0463	0.54		0.0832	0.0391
Nonvolatile Beta	16.4		3.42	5.17	11.3		2.51	3.99	12.3		3.08	4.8	13		3.02	4.38
Plutonium-241	0.15		0.191	0.321	0.238		0.215	0.391	0.38		0.206	0.369	0.152		0.209	0.386
Potassium-40	15.2		1.72	0.27	11.4		1.33	0.225	10.6		1.31	1.3	12.5		1.48	0.223
Radium-223	0.0317		0.312	0.469	-0.0707		0.218	0.366	-0.133		0.27	0.461	0.0269		0.22	0.378
Radium-226	0.538		0.0817	0.0318	0.483		0.0716	0.0268	0.519		0.0751	0.0296	0.572		0.0795	0.03
Radium-228	0.704		0.159	0.0901	0.467		0.122	0.0741	0.562		0.145	0.0873	0.479		0.115	0.0771
Strontium-90	-0.00875		0.0206	0.0357	-0.0271		0.0253	0.0404	-0.0182		0.0236	0.0375	-0.00537		0.0239	0.0335
Thallium-208	0.171		0.0389	0.0262	0.154		0.033	0.0246	0.166		0.0366	0.0237	0.17		0.0401	0.019
Thorium-228	0.541		0.239	0.134	0.539		0.128	0.0768	0.483		0.114	0.0678	0.591		0.141	0.0837
Thorium-230	0.525		0.229	0.0947	0.361		0.091	0.0111	0.393		0.0926	0.0101	0.441		0.11	0.0472
Thorium-232	0.316		0.163	0.0803	0.424		0.102	0.0279	0.379		0.0904	0.0101	0.437		0.107	0.0295
Thorium-234	0.426		0.765	0.827	0.719		0.788	0.632	0.373		0.818	0.781	0.717		0.775	0.687
Tritium	0.261		0.638	1.09	0.449		0.532	0.984	0.0279		0.563	1.08	0.0716		0.536	1.04
Uranium-233/234	0.299		0.0585	0.0339	0.346		0.0577	0.0271	0.357		0.0598	0.0185	0.464		0.0692	0.0172
Uranium-235	0.0215		0.0131	0.00586	0.00599		0.0163	0.0272	0.0282		0.0155	0.0146	0.0257		0.0176	0.0224
Uranium-238	0.357		0.0631	0.0199	0.394		0.0621	0.0236	0.361		0.0596	0.00509	0.414		0.0639	0.0135
Weight of Sample, A&B	38.2			0	41.6			0	48.1			0	38.5			0
Weight of Sample, SR-90	9.2			0	7			0	7.7			0	6			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC061				SSDTC062				SSDTC063				SSDTC064			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.461		0.122	0.0785	0.587		0.143	0.0715	0.489		0.136	0.0678	0.656		0.166	0.0868
Americium-241	-0.00213		0.0134	0.0192	0.00321		0.00289	0.00416	0.00942		0.00795	0.0151	0.017		0.0117	0.0179
Bismuth-212	0.298		0.172	0.17	0.349		0.153	0.179	0.305		0.17	0.159	0.491		0.173	0.181
Bismuth-214	0.42		0.0733	0.0415	0		0.0825	0.0967	0.429		0.0776	0.0405	0.455		0.0881	0.0466
Carbon-14	0.078		0.0848	0.142	0.0576		0.0716	0.12	0.138		0.0905	0.15	0.0686		0.0814	0.137
Cesium-137	0.0278		0.0186	0.0237	-0.00225		0.0126	0.0221	0.0228		0.0241	0.0215	0		0.022	0.0401
Cobalt-60	0.00545		0.013	0.0245	0.00568		0.0149	0.0275	0.00756		0.0127	0.024	0.00295		0.0154	0.0281
Gross Alpha	6.18		2.78	3.65	12.5		3.72	3.79	8.26		3.38	4.31	10.3		3.34	2.89
Lead-210	2.07		3.43	3.05	2.17		4.62	7.51	0.382		0.257	0.252	3.88		5.93	5.67
Lead-212	0.576		0.0735	0.0306	0.619		0.0802	0.0338	0.511		0.0691	0.0278	0.607		0.0824	0.0517
Lead-214	0.572		0.0899	0.0374	0.591		0.0863	0.0381	0.527		0.0769	0.036	0.551		0.0975	0.0592
Nonvolatile Beta	14.6		3.28	5.02	10.8		3.12	5.35	18.7		3.46	4.74	16.8		3.14	4.39
Plutonium-241	0.244		0.161	0.29	0.101		0.282	0.478	0.454		0.194	0.341	0.0515		0.216	0.367
Potassium-40	13		1.54	0.192	8.57		1.16	1.16	11.3		1.18	0.153	13.3		1.54	0.215
Radium-223	0.0318		0.215	0.374	-0.174		0.254	0.419	-0.139		0.199	0.332	-0.0756		0.41	0.608
Radium-226	0.512		0.0715	0.0275	0.55		0.0731	0.0297	0.524		0.0729	0.0349	0.571		0.118	0.0732
Radium-228	0.461		0.122	0.0785	0.587		0.143	0.0715	0.489		0.136	0.0678	0.656		0.166	0.0868
Strontium-90	0.0141		0.0259	0.0399	0.00286		0.036	0.05	0.995		0.11	0.107	0.753		0.137	0.18
Thallium-208	0.188		0.0355	0.0199	0.165		0.0339	0.0204	0.16		0.0379	0.0202	0.176		0.0358	0.0256
Thorium-228	0.762		0.164	0.0793	0.792		0.175	0.0728	0.439		0.109	0.0634	0.553		0.141	0.0736
Thorium-230	0.484		0.113	0.0402	0.483		0.119	0.0457	0.487		0.113	0.0443	0.447		0.121	0.0708
Thorium-232	0.598		0.131	0.0279	0.529		0.127	0.0457	0.542		0.121	0.0276	0.46		0.119	0.0421
Thorium-234	0.638		0.86	0.829	0.649		1.2	1.15	0.548		0.398	0.27	1.19		1.03	1.12
Tritium	-0.222		0.507	1.04	0.486		0.585	1.14	2.54		0.671	1.13	0		0.564	1.16
Uranium-233/234	0.419		0.0668	0.015	0.434		0.0656	0.0168	0.428		0.0723	0.0274	0.491		0.0786	0.0214
Uranium-235	0.023		0.0159	0.0191	0.0309		0.0141	0.00463	0.0315		0.0176	0.0168	0.00951		0.0113	0.0169
Uranium-238	0.398		0.0645	0.015	0.418		0.0636	0.0132	0.416		0.0699	0.0167	0.446		0.0731	0.00608
Weight of Sample, A&B	38			0	37.8			0	38.8			0	43.3			0
Weight of Sample, SR-90	6.9			0	4.6			0	35.4			0	35.3			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC065				SSDTC066				SSDTC067				SSDTC068			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.517		0.154	0.116	0.487		0.128	0.0772	0.66		0.164	0.109	0.568		0.142	0.08
Americium-241	0.00291		0.0053	0.0186	-0.00215		0.015	0.0187	0.012		0.00932	0.0164	-0.00128		0.00463	0.0151
Bismuth-212	0.689		0.218	0.219	0.212		0.178	0.169	0.549		0.274	0.219	0.391		0.189	0.161
Bismuth-214	0.507		0.0977	0.0537	0.461		0.0788	0.0372	0.593		0.103	0.051	0.44		0.0744	0.0398
Carbon-14	0.124		0.0842	0.14	0.0268		0.0686	0.116	0.128		0.0837	0.138	0.0625		0.0631	0.106
Cesium-137	-0.0162		0.0177	0.0289	-0.00307		0.0129	0.0224	-0.000504		0.0166	0.0287	0.00565		0.0129	0.0235
Cobalt-60	-0.000606		0.0189	0.0329	-0.00273		0.0139	0.0245	0.00543		0.0169	0.0312	0.00438		0.0142	0.0265
Gross Alpha	8.57		3.18	2.65	5.94		2.34	2.76	9.55		3.35	4.82	9.63		2.97	3.02
Lead-210	1.59		4.05	4.11	0.66		1.46	2.34	1.96		1.92	3.18	2.19		1.45	2.33
Lead-212	0.587		0.0776	0.0393	0.587		0.0755	0.0355	0.685		0.0895	0.0432	0.482		0.0639	0.0325
Lead-214	0.568		0.0921	0.0521	0.57		0.0914	0.0413	0.725		0.118	0.0532	0.474		0.0807	0.0399
Nonvolatile Beta	19		3.65	5.23	18.2		3.02	4.35	14.2		3.08	4.94	13.1		2.92	4.76
Plutonium-241	0.292		0.208	0.376	-0.026		0.199	0.342	0.153		0.181	0.332	0.192		0.173	0.315
Potassium-40	12		1.38	0.277	12.2		1.51	0.22	14.3		1.65	0.235	12.2		1.36	0.207
Radium-223	0.139		0.322	0.487	0.255		0.232	0.407	0		0.407	0.412	0.00392		0.228	0.389
Radium-226	0.569		0.0829	0.0282	0.521		0.074	0.0284	0.604		0.0891	0.035	0.468		0.0702	0.0314
Radium-228	0.517		0.154	0.116	0.487		0.128	0.0772	0.66		0.164	0.109	0.568		0.142	0.08
Strontium-90	1.95		0.21	0.197	2.62		0.233	0.208	0.0181		0.033	0.0456	0.00855		0.0248	0.0344
Thallium-208	0.173		0.037	0.0274	0.183		0.0347	0.0212	0.214		0.0456	0.0288	0.157		0.0341	0.0222
Thorium-228	0.57		0.131	0.056	0.658		0.148	0.0581	0.707		0.195	0.0895	0.402		0.0993	0.0626
Thorium-230	0.575		0.128	0.0288	0.494		0.118	0.0373	0.647		0.179	0.0617	0.41		0.0956	0.0362
Thorium-232	0.472		0.111	0.0114	0.478		0.114	0.0119	0.53		0.156	0.0711	0.366		0.0878	0.0251
Thorium-234	0.878		0.929	0.96	0.578		0.735	0.726	1.28		0.912	0.91	0.436		0.774	0.688
Tritium	2.93		0.678	1.1	2.73		0.683	1.11	0.369		0.574	1.15	0.35		0.569	1.09
Uranium-233/234	0.49		0.0761	0.00568	0.423		0.0687	0.0195	0.45		0.0759	0.0181	0.408		0.0748	0.0292
Uranium-235	0.0418		0.0182	0.0057	0.0259		0.014	0.00554	0.0479		0.0209	0.00653	0.0167		0.0128	0.00718
Uranium-238	0.519		0.0791	0.00568	0.418		0.0676	0.00553	0.531		0.0843	0.00651	0.431		0.0778	0.0326
Weight of Sample, A&B	37.1			0	41.5			0	39.7			0	44.7			0
Weight of Sample, SR-90	33			0	31.5			0	29.1			0	5.8			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC069				SSDTC070				SSDTC071				SSDTC072			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.431		0.149	0.0836	0.53		0.191	0.17	0.511		0.156	0.128	0.479		0.115	0.0629
Americium-241	0.000292		0.00086	0.02	0.00439		0.00547	0.0153	0.0136		0.00979	0.0161	-0.00221		0.0237	0.027
Bismuth-212	0.481		0.184	0.17	0.313		0.356	0.322	0.305		0.282	0.239	0.27		0.154	0.142
Bismuth-214	0.424		0.0766	0.0428	0.516		0.133	0.0836	0.622		0.105	0.0545	0.472		0.0782	0.0357
Carbon-14	0.17		0.0827	0.136	0.101		0.0643	0.106	0.198		0.0825	0.134	0.0807		0.0758	0.127
Cesium-137	-0.00388		0.0137	0.0234	0.00358		0.0301	0.0459	0.00382		0.0193	0.0318	0.00712		0.0148	0.0208
Cobalt-60	-0.00396		0.0148	0.0254	0.0129		0.0251	0.0468	0.01		0.0217	0.0418	-0.00254		0.0128	0.0215
Gross Alpha	7.23		2.71	3.53	9.01		3.04	3.24	11.1		2.98	2.7	6.41		2.3	1.83
Lead-210	0.476		1.65	2.1	2.29		1.52	2.52	1.61		2.3	3.99	0.862		1.03	0.901
Lead-212	0.407		0.0592	0.0476	0.625		0.102	0.062	0.51		0.0745	0.0421	0.614		0.0738	0.0283
Lead-214	0.482		0.0832	0.0431	0.562		0.139	0.0811	0.721		0.12	0.0532	0.583		0.0855	0.0344
Nonvolatile Beta	12.9		2.85	4.47	13.3		2.93	4.54	15.4		2.98	4.58	12.9		2.78	4.26
Plutonium-241	0.0267		0.334	0.57	0.0137		0.229	0.391	0.0232		0.212	0.361	0.0578		0.215	0.366
Potassium-40	12.2		1.44	0.217	10.6		1.3	0.455	11.7		1.51	0.316	12.7		1.34	0.155
Radium-223	-0.168		0.261	0.375	-0.241		0.513	0.734	0.359		0.288	0.531	-0.0406		0.221	0.328
Radium-226	0.428		0.0636	0.0297	0.492		0.0739	0.0288	0.628		0.0828	0.0248	0.544		0.089	0.0303
Radium-228	0.431		0.149	0.0836	0.53		0.191	0.17	0.511		0.156	0.128	0.479		0.115	0.0629
Strontium-90	-0.0221		0.026	0.0368	0.0301		0.0256	0.035	0.024		0.0378	0.0522	0.0798		0.0484	0.0657
Thallium-208	0.167		0.0319	0.0213	0.196		0.0544	0.0442	0.195		0.0449	0.0283	0.172		0.0321	0.0177
Thorium-228	0.474		0.109	0.0567	0.775		0.182	0.0971	0.57		0.126	0.0729	0.564		0.122	0.0658
Thorium-230	0.39		0.0914	0.0248	0.475		0.125	0.0657	0.449		0.1	0.00998	0.57		0.116	0.0093
Thorium-232	0.42		0.0961	0.0248	0.508		0.127	0.0347	0.522		0.112	0.026	0.425		0.094	0.0093
Thorium-234	0.255		0.86	0.638	1.5		1.36	1.24	0.648		1.05	0.885	0.748		0.514	0.474
Tritium	0		0.559	1.11	2.64		0.691	1.18	0.837		0.601	1.12	0.227		0.535	1.06
Uranium-233/234	0.379		0.0666	0.0214	0.435		0.0766	0.0333	0.362		0.0631	0.0162	0.414		0.0684	0.0199
Uranium-235	0.0244		0.0143	0.00609	0.0179		0.0127	0.0067	0.0104		0.0132	0.0205	0.0133		0.0101	0.00568
Uranium-238	0.381		0.0659	0.00608	0.361		0.0675	0.0273	0.399		0.0671	0.0162	0.42		0.069	0.0199
Weight of Sample, A&B	36.2			0	44.6			0	40.3			0	37.1			0
Weight of Sample, SR-90	5.4			0	6			0	29			0	29.1			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC073				SSDTC074				SSDTC075				SSDTC076			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.511		0.158	0.102	0.514		0.123	0.072	0.474		0.117	0.061	0.647		0.138	0.0682
Americium-241	-0.00816		0.0217	0.0228	0.00395		0.00699	0.0213	0.00741		0.0109	0.0263	0.0113		0.0116	0.01
Bismuth-212	0.553		0.234	0.194	0.269		0.18	0.153	0.33		0.132	0.131	0.42		0.169	0.153
Bismuth-214	0.578		0.0975	0.0526	0		0.0743	0.0881	0.41		0.0691	0.0314	0.54		0.0866	0.0377
Carbon-14	0.25		0.108	0.176	0.259		0.102	0.164	0.201		0.0805	0.13	0.494		0.139	0.22
Cesium-137	0.00917		0.0174	0.0267	-0.00763		0.0116	0.0199	-0.0079		0.00977	0.0163	-0.00629		0.0114	0.019
Cobalt-60	0.00298		0.019	0.033	-0.00175		0.013	0.0231	0.0129		0.0136	0.0174	0.00122		0.0126	0.0216
Gross Alpha	7.34		2.74	3.32	7.41		2.69	2.93	7.07		2.7	2.92	7.82		2.98	3.88
Lead-210	0.521		2.53	2.88	5.08		5.7	6.35	1.61		0.924	0.761	0.377		0.899	0.957
Lead-212	0.667		0.0875	0.0444	0.512		0.0686	0.0325	0.507		0.0614	0.0251	0.693		0.0813	0.0291
Lead-214	0.691		0.113	0.0496	0.479		0.0758	0.04	0.499		0.0701	0.0312	0.674		0.0938	0.035
Nonvolatile Beta	17		2.98	4.23	14.8		2.84	4.18	15		2.95	4.24	16.2		3.04	4.54
Plutonium-241	-0.02		0.23	0.386	0.2		0.187	0.341	0.231		0.184	0.335	0.0851		0.2	0.373
Potassium-40	12.8		1.6	0.274	11.9		1.58	0.189	12.4		1.31	0.154	15.3		1.61	0.186
Radium-223	0.141		0.32	0.496	0.125		0.229	0.365	-0.125		0.175	0.295	0.102		0.229	0.349
Radium-226	0.609		0.0992	0.0462	0.49		0.0989	0.0545	0.466		0.0679	0.0272	0.624		0.103	0.0382
Radium-228	0.511		0.158	0.102	0.514		0.123	0.072	0.474		0.117	0.061	0.647		0.138	0.0682
Strontium-90	1.83		0.215	0.218	-0.0165		0.0189	0.0268	0.0172		0.0423	0.0586	-0.0653		0.0369	0.0533
Thallium-208	0.204		0.0421	0.0272	0.154		0.0337	0.0182	0.143		0.0289	0.0152	0.207		0.036	0.0177
Thorium-228	0.592		0.129	0.0731	0.456		0.0979	0.0583	0.61		0.125	0.0544	0.894		0.318	0.16
Thorium-230	0.459		0.103	0.041	0.41		0.0861	0.0294	0.436		0.0957	0.034	0.647		0.248	0.138
Thorium-232	0.534		0.114	0.0254	0.439		0.0896	0.0202	0.537		0.111	0.034	0.678		0.252	0.0785
Thorium-234	0.256		0.785	0.85	0.719		1.1	1.06	0.656		0.523	0.42	0.844		0.666	0.485
Tritium	2.45		0.648	1.1	1.21		0.605	1.03	0.428		0.552	1	0.9		0.584	1.05
Uranium-233/234	0.39		0.0655	0.0286	0.362		0.0577	0.0183	0.406		0.0665	0.0341	0.45		0.0679	0.0193
Uranium-235	0.0322		0.0189	0.0219	0.0375		0.0154	0.00451	0.0237		0.0151	0.0174	0.0201		0.0159	0.0217
Uranium-238	0.429		0.0679	0.00534	0.395		0.0606	0.0125	0.357		0.0585	0.00494	0.446		0.0669	0.00473
Weight of Sample, A&B	42.3			0	44.3			0	39.8			0	45.3			0
Weight of Sample, SR-90	28.6			0	6.3			0	30.5			0	30.7			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC077				SSDTC078				SSDTC079				SSDTC080			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.558		0.158	0.0866	0.588		0.156	0.0966	0.666		0.147	0.0748	0.658		0.15	0.0853
Americium-241	-0.000754	UJ	0.00151	0.00329	0.00144	UJ	0.00167	0.00321	0.00378	UJ	0.00381	0.00415	0.00254	UJ	0.00256	0.00322
Bismuth-212	0.298		0.179	0.198	0.247		0.32	0.2	0.478		0.174	0.172	0.528		0.205	0.19
Bismuth-214	0.559		0.1	0.047	0.557		0.0956	0.0499	0.539		0.087	0.0384	0		0.0934	0.104
Carbon-14	-0.0388		0.0811	0.138	-0.032		0.0828	0.141	-0.0538		0.0795	0.136	0.111		0.0822	0.138
Cesium-137	-0.000554		0.0148	0.026	-0.0149		0.0154	0.0248	0.00254		0.0142	0.0225	-0.00476		0.0149	0.0247
Cobalt-60	0.0216	UJ	0.0334	0.0294	0.00454	UJ	0.0183	0.0324	-0.00133	UJ	0.0144	0.0256	0.018	UJ	0.0157	0.0296
Gross Alpha	10.1		2.82	1.92	8.09		2.53	2.33	9.16		2.76	3.12	8.46		2.47	1.56
Lead-210	-3.32	UJ	1.93	2.65	4.43	J	2.21	2.09	5.31	UJ	5.49	7.09	1.83	UJ	2.26	2.31
Lead-212	0.645		0.0794	0.0362	0.671		0.0831	0.0371	0.648		0.0824	0.0333	0.664		0.085	0.0366
Lead-214	0.617		0.0937	0.0472	0.635		0.098	0.0473	0.606		0.097	0.0376	0.587		0.0964	0.0469
Nonvolatile Beta	19.2		2.54	3.25	20.4		2.46	2.8	14.4		2.19	2.85	17.3		2.26	2.53
Plutonium-241	-0.0946		0.231	0.427	-0.0303		0.224	0.41	-0.214		0.25	0.385	-0.155		0.21	0.39
Potassium-40	11.8		1.35	0.235	13.4		1.56	0.246	12.4		1.64	0.17	12.9		1.59	0.239
Radium-223	-0.00173		0.271	0.456	-0.0632		0.287	0.42	-0.0195		0.236	0.408	0.132		0.271	0.428
Radium-226	0.59		0.0851	0.0317	0.556		0.0771	0.0328	0.579		0.0782	0.0271	0.641		0.0904	0.0316
Radium-228	0.558		0.158	0.0866	0.588		0.156	0.0966	0.666		0.147	0.0748	0.658		0.15	0.0853
Strontium-90	1.03		0.165	0.198	1.31		0.156	0.164	0.00438		0.0276	0.0437	1.42		0.168	0.159
Thallium-208	0.184		0.0389	0.0245	0.239		0.0469	0.0233	0.2		0.0392	0.0203	0.191		0.0401	0.0249
Thorium-228	0.669		0.34	0.276	0.311		0.181	0.207	0.676		0.375	0.387	0.501		0.249	0.235
Thorium-230	0.601		0.311	0.243	0.412		0.196	0.123	1.12		0.483	0.191	0.363		0.195	0.152
Thorium-232	0.29		0.195	0.142	0.469		0.211	0.11	0.521		0.29	0.092	0.418		0.208	0.106
Thorium-234	1.05		0.819	0.772	1.21		1.04	0.734	0.86		1.16	1.01	0.385		0.795	0.793
Tritium	0.971		0.503	0.949	0		0.554	1.16	0		0.525	1.09	-0.115		0.525	1.13
Uranium-233/234	0.515		0.0675	0.021	0.548		0.0705	0.0114	0.562		0.0716	0.0122	0.525		0.0692	0.0168
Uranium-235	0.0245		0.0109	0.00893	0.0235		0.0104	0.00731	0.0551		0.0161	0.00718	0.0202		0.0101	0.00932
Uranium-238	0.488		0.0642	0.0113	0.467		0.0624	0.00729	0.496		0.0649	0.00885	0.558		0.0721	0.0107
Weight of Sample, A&B	78.2			0	72.8			0	73.4			0	77.5			0
Weight of Sample, SR-90	29.8			0	37.2			0	6.1			0	31.3			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC081				SSDTC082				SSDTC083				SSDTC084			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.489		0.145	0.0798	0.694		0.176	0.104	0.769		0.176	0.0916	0.542		0.142	0.0783
Americium-241	0.00555	J	0.00425	0.00313	0.000212	UJ	0.000301	0.00292	-0.000795	UJ	0.00356	0.00936	0.00558	UJ	0.00533	0.01
Bismuth-212	0.284		0.19	0.177	0.487		0.211	0.217	0.277		0.198	0.221	0.415		0.211	0.179
Bismuth-214	0.529		0.0926	0.0424	0.599		0.111	0.0549	0.515		0.0958	0.0491	0		0.0859	0.105
Carbon-14	-0.0371		0.0785	0.134	0.0198		0.081	0.138	0.0696		0.0872	0.146	0.222		0.0926	0.152
Cesium-137	0.0116		0.0135	0.0246	-0.0116		0.0165	0.0275	-0.00514		0.0163	0.0273	0.011		0.0159	0.0259
Cobalt-60	-0.00179	UJ	0.0156	0.0275	-0.00588	UJ	0.018	0.0314	0.00377	UJ	0.0176	0.0315	0.00639	UJ	0.0148	0.0277
Gross Alpha	7.2		2.29	1.66	7.54		2.44	2.57	6.59		2.38	2.77	5.07		2.12	2.2
Lead-210	1.5	UJ	2.48	2.33	2.05	UJ	2.92	2.84	0	UJ	1.65	2.6	1.49	UJ	2.18	3.46
Lead-212	0.607		0.0807	0.035	0.752		0.0966	0.0417	0.644		0.083	0.0416	0.558		0.073	0.0339
Lead-214	0.581		0.0942	0.0423	0.719		0.116	0.05	0.619		0.102	0.0485	0.566		0.093	0.0438
Nonvolatile Beta	13.9		2.08	2.39	16.1		2.23	2.71	14.8		2.22	2.95	25.1		2.75	2.94
Plutonium-241	0.0304		0.247	0.42	-0.0179		0.228	0.389	-0.00873		0.259	0.443	-0.0369		0.236	0.433
Potassium-40	11.7		1.48	0.229	15		1.7	0.275	12.5		1.53	0.276	8.38		1.05	1.22
Radium-223	-0.126		0.285	0.413	-0.0778		0.344	0.503	0.187		0.319	0.482	-0.0217		0.255	0.431
Radium-226	0.495		0.076	0.0289	0.551		0.0789	0.0293	0.613		0.1	0.0339	0.56		0.0849	0.0397
Radium-228	0.489		0.145	0.0798	0.694		0.176	0.104	0.769		0.176	0.0916	0.542		0.142	0.0783
Strontium-90	0.293		0.0392	0.0479	0.207		0.046	0.0591	0.0498		0.0339	0.0462	-0.00946		0.0224	0.0383
Thallium-208	0.175		0.035	0.0232	0.229		0.0489	0.0256	0.186		0.0417	0.0266	0.159		0.038	0.0262
Thorium-228	0.433		0.248	0.278	0.612		0.343	0.381	0.599		0.293	0.277	0.339		0.218	0.261
Thorium-230	0.688		0.302	0.14	0.659		0.33	0.224	0.412		0.216	0.116	0.812		0.34	0.16
Thorium-232	0.581		0.27	0.119	0.713		0.341	0.146	0.649		0.287	0.137	0.593		0.276	0.121
Thorium-234	1.02		0.8	0.76	0.283		0.798	0.913	0.227		0.862	0.826	0.783		0.893	0.859
Tritium	-0.112		0.523	1.1	0		0.532	1.13	0		0.534	1.08	0.222		0.533	1.08
Uranium-233/234	0.554		0.0695	0.0106	0.479		0.0638	0.0132	0.482		0.0642	0.0105	0.466		0.0607	0.00945
Uranium-235	0.0294		0.0112	0.00675	0.0145		0.00888	0.0103	0.023		0.0107	0.00916	0.031		0.0121	0.0105
Uranium-238	0.524		0.0665	0.00831	0.501		0.0657	0.00726	0.51		0.067	0.0105	0.452		0.0593	0.00667
Weight of Sample, A&B	74.1			0	75.5			0	76.1			0	76.7			0
Weight of Sample, SR-90	31.5			0	24.3			0	30.4			0	7.2			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC085				SSDTC086				SSDTC087				SSDTC088			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.549		0.158	0.109	0.605		0.138	0.0799	0.641		0.149	0.0849	0.655		0.158	0.0942
Americium-241	0.00403	UJ	0.0043	0.00884	0.0012	UJ	0.00139	0.00288	0.00431	UJ	0.00356	0.00304	0.00373		0.00398	0.00859
Bismuth-212	0.48		0.222	0.246	0.543		0.181	0.16	0.493		0.201	0.189	0.646		0.295	0.189
Bismuth-214	0.571		0.102	0.0538	0.572		0.085	0.0392	0.507		0.0894	0.046	0.615		0.0999	0.0494
Carbon-14	0.0573		0.0971	0.164	0.0629		0.101	0.169	-0.0123		0.143	0.244	-0.0254		0.0697	0.12
Cesium-137	0.0106		0.019	0.0334	0.0219		0.0295	0.0221	-0.00887		0.0143	0.0242	0.0127		0.0173	0.0269
Cobalt-60	-0.00598	UJ	0.0197	0.0333	0.00145	UJ	0.0137	0.0248	0.0181	UJ	0.0221	0.0292	0.00521		0.0177	0.0311
Gross Alpha	8.54		2.64	1.99	8.76		2.6	1.96	11.2		2.97	1.95	8.15		2.52	2.32
Lead-210	1.09	UJ	4.5	3.54	2.22	UJ	4.35	4.34	-3.7	UJ	1.9	2.58	1.73		2.41	2.48
Lead-212	0.619		0.0812	0.0419	0.695		0.0842	0.0319	0.673		0.0819	0.0358	0.678		0.0871	0.0393
Lead-214	0.579		0.109	0.0525	0.661		0.0936	0.0402	0.609		0.0942	0.0439	0.772		0.118	0.047
Nonvolatile Beta	18.2		2.43	2.89	12.4		2.11	2.87	10.7		2.13	3.27	14.9		2.18	2.78
Plutonium-241	-0.154		0.233	0.432	-0.141		0.234	0.404	-0.0308		0.209	0.417	-0.00496	UJ	0.215	0.367
Potassium-40	12.4		1.44	0.253	14.3		1.62	0.231	12.5		1.4	0.249	14.8		1.81	0.264
Radium-223	-0.266		0.318	0.511	0.0231		0.224	0.387	-0.161		0.291	0.421	0.133		0.307	0.479
Radium-226	0.495		0.0721	0.028	0.639		0.108	0.0355	0.511		0.0754	0.024	0.644		0.0883	0.0279
Radium-228	0.549		0.158	0.109	0.605		0.138	0.0799	0.641		0.149	0.0849	0.655		0.158	0.0942
Strontium-90	0.772		0.125	0.143	-0.0338		0.0247	0.0434	0.0208		0.0251	0.0412	0.00445		0.0196	0.031
Thallium-208	0.186		0.0367	0.0288	0.208		0.0375	0.02	0.196		0.0375	0.0262	0.213		0.0413	0.025
Thorium-228	0.529		0.251	0.211	0.614		0.282	0.239	0.769		0.325	0.217	0.138		0.0437	0.0277
Thorium-230	0.432		0.215	0.16	0.633		0.274	0.154	0.53		0.25	0.16	0.162		0.0466	0.0143
Thorium-232	0.392		0.198	0.105	0.521		0.241	0.127	0.731		0.304	0.132	0.156		0.0453	0.0143
Thorium-234	0.561		0.946	0.973	0.877		0.906	0.883	0.555		0.684	0.775	0.845		0.898	0.811
Tritium	-0.56		0.506	1.1	5.2		0.734	1.08	-0.335		0.516	1.09	1.45		0.497	0.723
Uranium-233/234	0.502		0.0662	0.0133	0.523		0.0657	0.0109	0.521		0.0693	0.0111	0.459		0.0783	0.0216
Uranium-235	0.0244		0.0114	0.0115	0.0314		0.0117	0.00912	0.0269		0.0121	0.0111	0.024		0.0148	0.0132
Uranium-238	0.508		0.0666	0.0104	0.493		0.0627	0.00642	0.593		0.0763	0.00337	0.562		0.0898	0.016
Weight of Sample, A&B	76.4			0	74.3			0	81.5			0	73.7			0
Weight of Sample, SR-90	33.4			0	6.6			0	6.9			0	6.4			0

Table C-1
LEHR Environmental Restoration
Radiological Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC089				SSDTC090			
LAB_CHEM	CONC	ER_Q	ERROR	DET_LIMIT	CONC	ER_Q	ERROR	DET_LIMIT
Actinium-228	0.559		0.155	0.0871	0.457		0.132	0.0852
Americium-241	0.00116		0.00246	0.00977	3.22		0.482	0.00961
Bismuth-212	0.438		0.197	0.185	0.291		0.189	0.165
Bismuth-214	0.606		0.0916	0.047	0.518		0.0878	0.0418
Carbon-14	-0.0911		0.071	0.125	-0.00809		0.0909	0.137
Cesium-137	-0.00629		0.0138	0.0234	-0.00586		0.0127	0.0219
Cobalt-60	-0.00443		0.0164	0.0285	-0.00614		0.0141	0.0246
Gross Alpha	11.9		3.14	3.24	8.43		2.28	2.23
Lead-210	1.66		1.46	2.53	0.666		1.41	2.26
Lead-212	0.716		0.0913	0.0358	0.583		0.0716	0.0307
Lead-214	0.679		0.106	0.0434	0.584		0.0883	0.0412
Nonvolatile Beta	15.8		2.28	2.89	35		2.72	2.68
Plutonium-241	0.0914	UJ	0.197	0.385	-0.391		0.27	0.422
Potassium-40	14.2		1.74	0.267	12.2		1.34	0.215
Radium-223	-0.132		0.25	0.41	0.216		0.224	0.396
Radium-226	0.67		0.0953	0.031	0.516		0.0702	0.0279
Radium-228	0.559		0.155	0.0871	0.457		0.132	0.0852
Strontium-90	-0.00278		0.018	0.0289	1.43		0.203	0.17
Thallium-208	0.201		0.0383	0.0247	0.166		0.0378	0.0209
Thorium-228	0.158		0.0542	0.0325	0.531		0.198	0.174
Thorium-230	0.142		0.0503	0.0335	0.516		0.18	0.0843
Thorium-232	0.157		0.0529	0.029	0.407		0.153	0.033
Thorium-234	1.33		0.907	0.751	0.159		0.712	0.723
Tritium	0.906		0.497	0.818	0.181		0.583	1.13
Uranium-233/234	0.515		0.089	0.0316	0.486		0.0857	0.0292
Uranium-235	0.033		0.0189	0.0181	0.0149		0.0176	0.0293
Uranium-238	0.626		0.101	0.0205	0.51		0.0877	0.0185
Weight of Sample, A&B	77.3			0	71.5			0
Weight of Sample, SR-90	5.8			0	32			0

Table C-2
LEHR Environmental Restoration
Metals Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC020			SSDTC021			SSDTC022			SSDTC024			SSDTC025		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
Aluminum	18300		41.3	17300		40.5	14400		39.4	13300		40.1	13100		40.1
Antimony	1	UJ	12.5		UJ	0.52	0.65	UJ	12.8	0.87	UJ	12.4	0.95	UJ	12
Arsenic	8.3		2.1	7.5		2	7.2		2	7.1		2	9		2
Barium	172		41.3	164		40.5	141		39.4	158		40.1	111		40.1
Beryllium	0.49	J	1	0.42	J	1	0.35	J	0.99	0.32	J	1	0.31	J	1
Cadmium			0.24			0.23			0.22			0.23			0.23
Calcium	4410		1030	4590		1010	5580		986	4470		1000	5330		1000
Chromium	165		2.1	209		2	234		2	190		2	314		2
Chromium, Hexavalent	0.223		0.212	0.294		0.21	0.214		0.195	0.165		0.206	0.162		0.202
Cobalt	23.8		10.3	23.8		10.1	22.5		9.9	22.6		10	21.2		10
Copper	38.3		5.2	36.4		5.1	29.5		4.9	27.6		5	24.5		5
Iron	38500	J	20.6	38000	J	20.3	35100	J	19.7	34100	J	20.1	35900	J	20
Lead	7.4		0.62	6.5		0.61	6.1		0.59	5.6		0.6	4.6		0.6
Magnesium	26700		1030	31600		1010	32400		986	34300		1000	38000		1000
Manganese	639		3.1	633		3	553		3	631		3	493		3
Mercury	1.5	J	0.033	0.49	J	0.032	0.9	J	0.032	0.71	J	0.03	0.21	J	0.029
Molybdenum			0.17			0.16			0.16			0.16			0.16
Nickel	299		8.3	329		8.1	315		7.9	344		8	369		8
Nitrate	0.77	UJ	1	2.08	UJ	1	15.7		1	9.13		1	0.998	UJ	1
Potassium	1460		1030	1370		1010	951	J	986	919	J	1000	788	J	1000
Selenium			0.5			0.49			0.47			0.48			0.48
Silver			0.42			0.41	0.4	J	2			0.4	0.42	J	2
Sodium	141	J	1030	171	J	1010	229	J	986	187	J	1000	201	J	1000
Thallium			0.82			0.81			0.78			0.8			0.8
Vanadium	66.4		10.3	63.1		10.1	57		9.9	54.2		10	56.8		10
Zinc	150		4.1	63.3		4	55.9		3.9	57.5		4	48.6		4

Table C-2
LEHR Environmental Restoration
Metals Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC026			SSDTC027			SSDTC028			SSDTC029			SSDTC030		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
Aluminum	13200		38.9	14000		40.1	12400		41.4	15200		42.3	14300		42.2
Antimony	1	UJ	12.5	1.3	UJ	12.1		UJ	0.52	0.79	UJ	13.3		UJ	0.51
Arsenic	6.9		1.9	6.2		2	6.8		2.1	9.3		2.1	8.1		2.1
Barium	127		38.9	150		40.1	132		41.4	173		42.3	155		42.2
Beryllium	0.32	J	0.97	0.33	J	1	0.33	J	1	0.38	J	1	0.36	J	1
Cadmium			0.22			0.23			0.24			0.24			0.24
Calcium	4430		974	4410		1000	3810		1030	3800		1060	3910		1050
Chromium	186		1.9	216		2	174		2.1	116		2.1	272		2.1
Chromium, Hexavalent	0.194		0.204	0.227		0.206	0.265		0.212	0.138		0.212			0.2
Cobalt	23		9.7	22.4		10	19.3		10.3	22.7		10.6	21.7		10.5
Copper	26.3		4.9	28		5	26.4		5.2	32.4		5.3	29.4		5.3
Iron	34600	J	19.5	35000	J	20	33900	J	20.7	34800	J	21.2	36600		21.1
Lead	5.2		0.58	5.5		0.6	5.6		0.62	10.3		0.63	6.6	J	0.63
Magnesium	35000		974	31600		1000	27600		1030	22800		1060	32900		1050
Manganese	541		2.9	679		3	490		3.1	687		3.2	593		3.2
Mercury	0.99	J	0.032	0.15	J	0.032	0.76	J	0.031	0.48	J	0.035	0.19	J	0.029
Molybdenum			0.16			0.16			0.17			0.17			0.17
Nickel	342		7.8	327		8	266		8.3	233		8.5	315		8.4
Nitrate	0.694	UJ	1	0.763	UJ	1	2	UJ	1			1	1.41	UJ	1
Potassium	857	J	974	999	J	1000	905	J	1030	1050	J	1060	1130		1050
Selenium			0.47			0.48			0.5			0.51			0.51
Silver	0.43	J	1.9			0.4			0.42			0.43			0.42
Sodium	189	J	974	134	J	1000	199	J	1030	119	J	1060	141	J	1050
Thallium			0.77			0.8			0.82			0.84			0.84
Vanadium	55.1		9.7	55.8		10	51.3		10.3	59		10.6	57.8		10.5
Zinc	50.7		3.9	52.8		4	53.4		4.1	59.9		4.2	57		4.2

Table C-2
LEHR Environmental Restoration
Metals Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC031			SSDTC032			SSDTC033			SSDTC034			SSDTC035		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
Aluminum	16300		43.7	21800		42.1	15500		44.1	15300		42.2	22700		43.7
Antimony		UJ	0.55	0.73	UJ	13.1	0.65	UJ	13.6	1.1	UJ	12.8	0.88	UJ	13.6
Arsenic	7.6		2.2	8.6		2.1	7.3		2.2	7.5		2.1	9		2.2
Barium	164		43.7	206		42.1	154		44.1	197		42.2	222		43.7
Beryllium	0.39	J	1.1	0.51	J	1	0.38	J	1.1	0.37	J	1	0.55	J	1.1
Cadmium			0.25			0.24			0.25			0.24			0.25
Calcium	5170		1090	4210		1050	4820		1100	4290		1060	3990		1090
Chromium	146		2.2	135		2.1	150		2.2	145		2.1	137		2.2
Chromium, Hexavalent	0.143		0.22	0.367		0.204	0.13		0.216	0.546		0.206	0.28		0.224
Cobalt	22.3		10.9	23.1		10.5	22.2		11	19.9		10.6	24.3		10.9
Copper	35.5		5.5	43		5.3	32.2		5.5	36.1		5.3	46.3		5.5
Iron	35600	J	21.8	40500	J	21	35300	J	22.1	33200	J	21.1	41700	J	21.8
Lead	9		0.66	6.8		0.63	6.4		0.66	9.2		0.63	7.4		0.66
Magnesium	25300		1090	18000		1050	25700		1100	21400		1060	18000		1090
Manganese	602		3.3	645		3.2	554		3.3	545		3.2	689		3.3
Mercury	2.4	J	0.033	0.2	J	0.031	1.3	J	0.038	1	J	0.034	0.22	J	0.036
Molybdenum			0.18			0.17			0.18			0.17			0.18
Nickel	263		8.7	241		8.4	262		8.8	231		8.4	250		8.7
Nitrate	54.9		1	0.37	UJ	1	2.13	UJ	1	35.7		1	0.564	UJ	1
Potassium	1340		1090	1810		1050	1230		1100	1290		1060	1810		1090
Selenium			0.53			0.51			0.53			0.51			0.53
Silver			0.44			0.42			0.44	0.49	J	2.1	0.51	J	2.2
Sodium	191	J	1090	115	J	1050	162	J	1100	168	J	1060	184	J	1090
Thallium			0.87			0.84			0.88			0.84			0.87
Vanadium	62.8		10.9	76.4		10.5	62.7		11	59.5		10.6	78.1		10.9
Zinc	71.1		4.4	74.1		4.2	63.8		4.4	70.7		4.2	78.4		4.4

Table C-2
LEHR Environmental Restoration
Metals Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC036			SSDTC037			SSDTC038			SSDTC039			SSDTC040		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
Aluminum	21900		41.9	17100		42.8	19100		42.3	15900		43.1	19500		44.1
Antimony	0.78	UJ	12.9	0.97	UJ	12.8	1.1	UJ	12.6		UJ	0.52		UJ	0.54
Arsenic	8.4		2.1	8		2.1	7.2		2.1	7.5		2.2	8.1		2.2
Barium	212		41.9	171		42.8	175		42.3	161		43.1	210		44.1
Beryllium	0.53	J	1	0.42	J	1.1	0.45	J	1	0.39	J	1.1	0.52	J	1.1
Cadmium			0.24			0.24			0.24			0.25			0.25
Calcium	3670		1050	4290		1070	4400		1060	4150		1080	4110		1100
Chromium	121		2.1	140		2.1	154		2.1	155		2.2	124	J	2.2
Chromium, Hexavalent	0.445		0.212	0.259		0.216	0.238		0.216	0.229		0.218	0.627		0.224
Cobalt	23.3		10.5	23.2		10.7	22.9		10.6	22.5		10.8	23.6		11
Copper	44.1		5.2	36.9		5.4	36.1		5.3	34.9		5.4	44.6		5.5
Iron	39900	J	21	36700	J	21.4	37800	J	21.1	34900	J	21.5	38900		22
Lead	7.5		0.63	7		0.64	6.9		0.63	7.2		0.65	8.3		0.66
Magnesium	15900		1050	25600		1070	23600		1060	25300		1080	16500	J	1100
Manganese	672		3.1	627		3.2	589		3.2	580		3.2	720		3.3
Mercury	0.17	J	0.035	1.1	J	0.028	0.17	J	0.029	0.98	J	0.034	0.74	J	0.034
Molybdenum			0.17			0.17			0.17			0.17	0.35	J	2.2
Nickel	235		8.4	278		8.6	270		8.4	268		8.6	226	J	8.8
Nitrate			1	7.58		1	16.2		1	8.53		1			1
Potassium	1730		1050	1380		1070	1490		1060	1230		1080	1950		1100
Selenium			0.5			0.51			0.51			0.52	0.78	J	1.1
Silver	0.54	J	2.1			0.43			0.43			0.43			0.44
Sodium	131	J	1050	194	J	1070	214	J	1060	164	J	1080	130	J	1100
Thallium			0.83			0.87			0.84			0.86	1	J	2.2
Vanadium	74.4		10.5	65.1		10.7	67.6		10.6	61.3		10.8	68.5		11
Zinc	73.8		4.2	70.4		4.3	64.8		4.2	67.1		4.3	77.3		4.4

Table C-2
LEHR Environmental Restoration
Metals Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC041			SSDTC042			SSDTC043			SSDTC044			SSDTC045		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
Aluminum	18200		42.3	17500		41.1	18900		43.7	18800		42.4	19400		44
Antimony		UJ	0.52		UJ	0.5		UJ	0.54		UJ	0.52		UJ	0.54
Arsenic	8.1		2.1	7.6		2	8.6		2.2	8.5		2.1	8.7		2.2
Barium	204		42.3	185		41.1	194		43.7	224		42.4	210		44
Beryllium	0.52	J	1	0.47	J	1	0.5	J	1.1	0.5	J	1	0.51	J	1.1
Cadmium			0.24			0.23			0.25			0.24			0.25
Calcium	3660		1060	3570		1030	4530		1090	5880		1060	6330		1100
Chromium	118	J	2.1	127	J	2	98.4	J	2.2	105	J	2.1	100	J	2.2
Chromium, Hexavalent	0.561		0.22	0.539		0.22	0.226		0.226	0.134	UJ	0.224	0.211		0.234
Cobalt	23.4		10.6	22.5		10.3	22.8		10.9	22		10.6	22.8		11
Copper	43.1		5.3	39.4		5.1	45.1		5.5	41.8		5.3	44.6		5.5
Iron	37700		21.1	36600		20.5	37700		21.8	37900		21.2	37900		22
Lead	7.9		0.63	7.2		0.62	8.1		0.66	7.6		0.64	7.9		0.66
Magnesium	17500	J	1060	19800	J	1030	21300	J	1090	25300	J	1060	19900	J	1100
Manganese	692		3.2	643		3.1	683		3.3	614		3.2	684		3.3
Mercury	0.53	J	0.035	0.2	J	0.035	0.23	J	0.031	0.14	J	0.036	0.13	J	0.034
Molybdenum	0.25	J	2.1	0.21	J	2	0.28	J	2.2	0.29	J	2.1	0.43	J	2.2
Nickel	240	J	8.4	250	J	8.2	212	J	8.7	223	J	8.5	208	J	8.8
Nitrate	1.09		1	2.01		1	1.28		1	0.472		1	7.43		1
Potassium	1580		1060	1460		1030	1380		1090	1150		1060	1530		1100
Selenium			0.51			0.49	0.89	J	1.1	0.78	J	1	0.72	J	1.1
Silver			0.43			0.43			0.46			0.44			0.47
Sodium	99.6	J	1060	114	J	1030	138	J	1090	132	J	1060	156	J	1100
Thallium	0.96	J	2.1			0.82			0.87			0.84			0.89
Vanadium	64.3		10.6	62.2		10.3	65.3		10.9	65.1		10.6	65.9		11
Zinc	78.8		4.2	71		4.1	79.6		4.4	75.7		4.2	79.4		4.4

Table C-2
LEHR Environmental Restoration
Metals Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC046			SSDTC047			SSDTC048			SSDTC049			SSDTC050		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
Aluminum	19300		44.9	17500		42.8	21100		45.2	22200		44.6	21700		44.5
Antimony		UJ	0.55	0.58	J	12.8		UJ	0.56		UJ	0.55		UJ	0.55
Arsenic	9		2.2	8.7		2.1	8.7		2.3	8.9		2.2	8.5		2.2
Barium	189		44.9	184		42.8	224		45.2	241		44.6	231		44.5
Beryllium	0.52	J	1.1	0.49	J	1.1	0.59	J	1.1	0.61	J	1.1	0.6	J	1.1
Cadmium			0.26			0.24			0.26			0.25			0.25
Calcium	4320		1120	4390		1070	4120		1130	3820		1120	3780		1110
Chromium	84.5	J	2.2	96.8	J	2.1	112	J	2.3	112	J	2.2	111	J	2.2
Chromium, Hexavalent	0.26		0.236	0.134	UJ	0.224	0.538		0.234	0.576		0.226	1.04		0.236
Cobalt	22.5		11.2	22.7		10.7	26.2		11.3	25.1		11.2	25.9		11.1
Copper	47.5		5.6	42.7		5.4	49.5		5.6	50.1		5.6	50.1		5.6
Iron	37800		22.5	36400		21.4	41400		22.6	42200		22.3	41900		22.2
Lead	8		0.67	7.9		0.64	8.1		0.68	8.3		0.67	8.5		0.67
Magnesium	17700	J	1120	20600	J	1070	14600	J	1130	14800	J	1120	14600	J	1110
Manganese	737		3.4	718		3.2	793		3.4	740		3.3	800		3.3
Mercury	0.16	J	0.038	0.28	J	0.034	0.12	J	0.037	0.1	J	0.032	0.19	J	0.034
Molybdenum	0.32	J	2.2	0.38	J	2.1	0.37	J	2.3	0.37	J	2.2	0.3	J	2.2
Nickel	186	J	9	210	J	8.6	231	J	9	230	J	8.9	236	J	8.9
Nitrate	379		3	212		2.28			1	1.41		1			1
Potassium	1700		1120	1400		1070	1850		1130	1840		1120	1920		1110
Selenium	0.84	J	1.1			0.51			0.54	0.99	J	1.1	1.4		1.1
Silver			0.47	0.45	J	2.2	0.52	J	2.3			0.45			0.47
Sodium	150	J	1120	177	J	1070	102	J	1130	135	J	1120	118	J	1110
Thallium			0.89			0.85			0.9			0.89			0.88
Vanadium	65.5		11.2	62.5		10.7	72.4		11.3	73.3		11.2	73.2		11.1
Zinc	82.9		4.5	76.4		4.3	82.7		4.5	83.8		4.5	84.3		4.4

Table C-2
LEHR Environmental Restoration
Metals Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC051			SSDTC052			SSDTC053			SSDTC054			SSDTC055		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
Aluminum	17800		42.5	17700		45.6	13400		40.2	19900		45.2	13700		42.8
Antimony		UJ	0.52		UJ	0.56		UJ	0.49		UJ	0.55		UJ	0.53
Arsenic	8.5		2.1	8.1		2.3	8.2		2	8.3		2.2	7.4		2.1
Barium	176		42.5	186		45.6	154		40.2	188		45.2	145		42.8
Beryllium	0.47	J	1.1	0.48	J	1.1	0.39	J	1	0.55	J	1.1	0.37	J	1.1
Cadmium			0.24			0.26			0.23			0.26			0.24
Calcium	4540		1060	4730		1140	4630		1010	2890		1130	4890		1070
Chromium	144	J	2.1	146	J	2.3	128	J	2	108	J	2.2	119	J	2.1
Chromium, Hexavalent	0.633		0.226	1.06		0.23	0.248		0.216	0.499		0.232	0.233		0.222
Cobalt	23.9		10.6	24.2		11.4	24		10.1	24.3		11.3	20.3		10.7
Copper	40.5		5.3	41.6		5.7	31.9		5	47.6		5.6	31.6		5.4
Iron	39500		21.2	38700		22.8	34900		20.1	39900		22.6	33400		21.4
Lead	7.5		0.64	7.5		0.68	6.6		0.6	8.2		0.68	7.2		0.64
Magnesium	24200	J	1060	21300	J	1140	28800	J	1010	20100	J	1130	21300	J	1070
Manganese	680		3.2	700		3.4	625		3	672		3.4	550		3.2
Mercury	2.3	J	0.074	0.27	J	0.037	0.5	J	0.029	0.12	J	0.038	0.73	J	0.037
Molybdenum	0.23	J	2.1	0.36	J	2.3	0.29	J	2	0.24	J	2.2	0.2	J	2.1
Nickel	262	J	8.5	252	J	9.1	314	J	8	236	J	9	217	J	8.6
Nitrate	31		1	49.3		1	0.81		1	118		1			1
Potassium	1410		1060	1660		1140	1050		1010	1440		1130	1100		1070
Selenium	0.84	J	1.1	0.99	J	1.1	0.67	J	1			0.54	0.85	J	1.1
Silver			0.44	0.75	J	2.2			2.1	0.75	J	2.2			0.44
Sodium	151	J	1060	143	J	1140	141	J	1010	149	J	1130	86.3	J	1070
Thallium	0.87	J	2.1			0.91			0.8			0.9			0.85
Vanadium	65.6		10.6	65.3		11.4	53.8		10.1	65.6		11.3	55.6		10.7
Zinc	74.9		4.2	75.3		4.6	64.1		4	78.8		4.5	67.5		4.3

Table C-2
LEHR Environmental Restoration
Metals Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC056			SSDTC057			SSDTC058			SSDTC059			SSDTC060		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
Aluminum	19100		43.9	15000		44.7	14700		41.1	16200		42	17800		41.3
Antimony		UJ	0.54		UJ	0.55	0.75	J	12.3	0.79	J	12.6	1.4	J	12.4
Arsenic	8		2.2	8.6		2.2	6.6		2	7.6		2.1	7.9		2.1
Barium	200		43.9	163		44.7	152		41.1	166		42	164		41.3
Beryllium	0.53	J	1.1	0.46	J	1.1	0.35	J	1	0.4	J	1	0.43	J	1
Cadmium			0.25			0.25			0.23			0.24			0.24
Calcium	4350		1100	5170		1120	3890		1030	4020		1050	4450		1030
Chromium	119	J	2.2	72.2	J	2.2	114		2	154		2.1	150		2.1
Chromium, Hexavalent	0.29		0.232	0.288		0.23	0.132	UJ	0.22	0.146	UJ	0.224	0.269	UJ	0.224
Cobalt	20.7		11	17.3		11.2	19.5		10.3	23.5		10.5	23.1		10.3
Copper	43.1		5.5	36.5		5.6	36.3	J	5.1	34.1	J	5.2	36.2	J	5.2
Iron	38800		21.9	31500		22.4	31100		20.5	37000		21	36800		20.7
Lead	7.7		0.66	8.4		0.67	6.9		0.62	6.5		0.63	7.3		0.62
Magnesium	15400	J	1100	14100	J	1120	20300		1030	28500		1050	25800		1030
Manganese	550		3.3	578		3.4	547		3.1	603		3.2	606		3.1
Mercury	0.3	J	0.033	0.45	J	0.038	1.3		0.035	0.38		0.037	0.74		0.033
Molybdenum	0.29	J	2.2	0.34	J	2.2		UJ	0.17		UJ	0.17		UJ	0.17
Nickel	209	J	8.8	126	J	8.9	218		8.2	287		8.4	272		8.3
Nitrate			1			1	17.9		1	2.02	UJ	1	39.3		1
Potassium	1700		1100	1450		1120	1290	J	1030	1410	J	1050	1600	J	1030
Selenium	1.2		1.1	0.99	J	1.1			0.49			0.51			0.5
Silver			0.45			0.46			0.44			0.44			0.44
Sodium	110	J	1100	111	J	1120	141	J	1100	118	J	1100	150	J	1100
Thallium			0.87	1.4	J	2.2			0.82			0.83			8.2
Vanadium	67.8		11	54.2		11.2	53.8		10.3	62.8		10.5	64.4		10.3
Zinc	75.5		4.4	72.1		4.5	66.3		4.1	65.9		4.2	68.2		4.1

Table C-2
LEHR Environmental Restoration
Metals Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC061			SSDTC062			SSDTC063			SSDTC064			SSDTC065		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
Aluminum	17400		42.1	17200		42.2	18300		44.3	19300		44.7	20800		44.2
Antimony	1.4	J	12.6	1.2	J	12.6	1.1	J	13.3	0.99	J	13.4	1.4	J	13.3
Arsenic	7.4		2.1	8.2		2.1	8.3		2.2	9.5		2.2	8.4		2.2
Barium	172		42.1	181		42.2	187		44.3	198		44.7	209		44.2
Beryllium	0.43	J	1	0.44	J	1	0.47	J	1.1	0.48	J	1.1	0.52	J	1.1
Cadmium			0.24			0.24			0.25			0.25			0.25
Calcium	4340		1050	4800		1050	4690		1110	5480		1120	9240		1100
Chromium	145		2.1	138		2.1	129		2.2	119		2.2	122		2.2
Chromium, Hexavalent	0.355		0.222	0.217	UJ	0.228	0.114	UJ	0.228	0.138	UJ	0.23	0.215	UJ	0.226
Cobalt	24.6		10.5	23		10.5	23.6		11.1	22.7		11.2	23.8		11
Copper	36.8	J	5.3	36.8	J	5.3	39.3	J	5.5	40.9	J	5.6	45.5	J	5.5
Iron	36800		21	37100		21.1	38300		22.1	38300		22.4	39500		22.1
Lead	7.3		0.63	6.8		0.63	7.2		0.66	8.3		0.67	8.1		0.66
Magnesium	25600		1050	23000		1050	28000		1110	24800		1120	26000		1100
Manganese	647		3.2	657		3.2	607		3.3	636		3.4	689		3.3
Mercury	1.1		0.034	3.1		0.18	0.22		0.031	0.27		0.039	0.54		0.038
Molybdenum		UJ	0.17		UJ	0.17		UJ	0.18		UJ	0.18		UJ	0.18
Nickel	273		8.4	246		8.4	263		8.8	236		8.9	244		8.8
Nitrate	60.6		1	0.644	UJ	1	1.43	UJ	1	0.757	UJ	1	3.68		1
Potassium	1490	J	1050	1380	J	1050	1250	J	1110	1340	J	1120	1470	J	1100
Selenium			0.51			0.51			0.53			0.54	0.74	J	1.1
Silver			0.45			0.46			0.46			0.46			0.45
Sodium	145	J	1110	134	J	1150	141	J	1150	150	J	1140	172	J	1120
Thallium			0.84			0.84			0.88			0.89			0.88
Vanadium	63.5		10.5	63.8		10.5	66.4		11.1	68		11.2	69.9		11
Zinc	72.5		4.2	68.9		4.2	71.2		4.4	74.7		4.5	78.4		4.4

Table C-2
LEHR Environmental Restoration
Metals Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC066			SSDTC067			SSDTC068			SSDTC069			SSDTC070		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
Aluminum	19600		41.7	25000		46.6	15600		43.6	14100		44.5	16000		44.4
Antimony	1.2	J	12.5	1.3	J	14	1.1	J	13.1	1.5	J	13.3	1	J	13.3
Arsenic	8.8		2.1	8.2		2.3	7.7		2.2	7.3		2.2	8		2.2
Barium	187		41.7	196		46.6	154		43.6	138		44.5	181		44.4
Beryllium	0.48	J	1	0.6	J	1.2	0.4	J	1.1	0.36	J	1.1	0.41	J	1.1
Cadmium			0.24			0.27			0.25			0.25			0.25
Calcium	6230		1040	3180		1160	4750		1090	4280		1110	5030		1110
Chromium	147		2.1	122		2.3	160		2.2	146		2.2	128		2.2
Chromium, Hexavalent	0.136	UJ	0.226	0.449		0.23	0.144	UJ	0.222	0.233	UJ	0.222	0.421		0.234
Cobalt	23.9		10.4	25.5		11.6	24.1		10.9	22.2		11.1	23.3		11.1
Copper	42.6	J	5.2	51.5	J	5.8	33.3	J	5.4	29.8	J	5.6	39.2	J	5.5
Iron	39200		20.8	44200		23.3	37100		21.8	34300		22.2	35500		22.2
Lead	8.6		0.62	8		0.7	6.9		0.65	6		0.67	6.8		0.66
Magnesium	25600		1040	20300		1160	30700		1090	28600		1110	23600		1110
Manganese	675		3.1	702		3.5	569		3.3	528		3.3	621		3.3
Mercury	0.66		0.033	0.15		0.038	0.58	J	0.033	6.1	J	0.19	0.66		0.037
Molybdenum		UJ	0.17		UJ	0.19		UJ	0.18		UJ	0.18		UJ	0.18
Nickel	272		8.3	248		0.93	300		8.7	282		8.9	254		8.9
Nitrate	7.77		1	4.89		1	5.12		1	3.37		1	0.785	UJ	1
Potassium	1550	J	1040	2030	J	1160	1290	J	1090	1190	J	1110	1200	J	1110
Selenium			0.5			0.56			0.52			0.54			0.53
Silver			0.44			0.47			0.45			0.44			0.46
Sodium	176	J	1090	183	J	1180	195	J	1110	174	J	1090	145	J	1130
Thallium			0.83			0.93			0.87			0.88			0.88
Vanadium	69		10.4	79.2		11.6	61.3		10.9	56.4		11.1	60.5		11.1
Zinc	74.6		4.2	83.5		4.6	65.3		4.4	59		4.4	71.2		4.4

Table C-2
LEHR Environmental Restoration
Metals Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC071			SSDTC072			SSDTC073			SSDTC074			SSDTC075		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
Aluminum	17400		43.3	17400		44.2	18400		43.1	16100		41	15100		40.2
Antimony	1	J	13	1.1	J	13.3	0.97	J	12.9	1.1	J	12.3	1.3	J	12
Arsenic	8.4		2.2	7.9		2.2	7.8		2.2	7.2		2	7.2		2
Barium	177		43.3	175		44.2	199		43.1	158		41	158		40.2
Beryllium	0.44	J	1.1	0.43	J	1.1	0.46	J	1.1	0.39	J	1	0.38	J	1
Cadmium			0.25			0.25			0.25			0.23			0.23
Calcium	4830		1080	4940		1100	14900		1080	4920		1020	5140		1000
Chromium	139		2.2	144		2.2	110		2.2	149		2	164		2
Chromium, Hexavalent	0.328	UJ	0.226	0.17	UJ	0.226	0.182	UJ	0.228	0.257	UJ	0.214	0.171	UJ	0.214
Cobalt	23.3		10.8	24		11	21.7		10.8	22.2		10.2	22.2		10
Copper	39.2	J	5.4	38.4	J	5.5	41.3	J	5.4	34.4	J	5.1	31.8	J	5
Iron	37200		21.6	37300		22.1	36800		21.5	35700		20.5	36000		20.1
Lead	7.9		0.65	7.9		0.66	7.3		0.64	6.2		0.61	6		0.6
Magnesium	24300		1080	26400		1100	26100		1080	24300		1020	26600		1000
Manganese	635		3.2	616		3.3	573		3.2	552		3.1	570		3
Mercury	1.2		0.038	1.4		0.036	0.19		0.036	4.3		0.18	1.6		0.035
Molybdenum		UJ	0.18		UJ	0.18		UJ	0.17		UJ	0.17		UJ	0.16
Nickel	256		8.6	282		8.8	227		8.6	251		8.2	266		8
Nitrate	5.46		1	19.3		1	49.2		1	1.37	UJ	1	1.82	UJ	1
Potassium	1500	J	1080	1490	J	1100	1280	J	1080	1360	J	1020	1130	J	1000
Selenium			0.52			0.53			0.52			0.49			0.48
Silver			0.44			0.46			0.46			0.43			0.43
Sodium	130	J	1100	190	J	1140	215	J	1150	127	J	1060	143	J	1060
Thallium			0.86			0.88			0.86			0.81			0.8
Vanadium	64		10.8	63.6		11	62.5		10.8	61.3		10.2	60.9		10
Zinc	71.1		4.3	78		4.4	71.8		4.3	64.3		4.1	62.8		4

Table C-2
LEHR Environmental Restoration
Metals Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC076			SSDTC077			SSDTC078			SSDTC079			SSDTC080		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
Aluminum	21200		44	21000		45.2	21100		44.5	26300		43.6	23000		45
Antimony	0.96	J	13.2		UJ	0.56		UJ	0.55		UJ	0.53		UJ	0.55
Arsenic	7.6		2.2	8.3		2.3	8.5		2.2	8.2		2.2	8.9		2.2
Barium	217		44	201		45.2	152		44.5	244		43.6	165		45
Beryllium	0.53	J	1.1	0.53	J	1.1	0.53	J	1.1	0.64	J	1.1	0.56	J	1.1
Cadmium			0.25			0.26			0.25			0.25			0.26
Calcium	4780		1100	10500		1130	4940		1110	3520		1090	8070		1120
Chromium	125		2.2	105		2.3	115		2.2	122		2.2	114		2.2
Chromium, Hexavalent	0.545		0.218	0.105	UJ	0.234	0.153		0.236	0.209		0.232			0.236
Cobalt	24.2		11	22.4		11.3	23		11.1	24.8		10.9	23.5		11.2
Copper	47	J	5.5	44.6		5.6	43.9		5.6	50		5.4	48.8		5.6
Iron	40400		22	38200		22.6	39000		22.2	42800		21.8	40700		22.5
Lead	7.4		0.66	7.3		0.68	7.4		0.67	7.7		0.65	7.3		0.68
Magnesium	18500		1100	25500		1130	23100		1110	15100		1090	23600		1120
Manganese	709		3.3	663		3.4	744		3.3	760		3.3	968		3.4
Mercury	3		0.18	0.29		0.037	0.12		0.032	0.13		0.033	0.16		0.036
Molybdenum		UJ	0.18	0.29	J	2.3	0.36	J	2.2	0.27	J	2.2	0.3	J	2.2
Nickel	231		8.8	221		9	237		8.9	240		8.7	230		9
Nitrate	0.454	UJ	1	8.04		1	85		1	68.9		1	700		6.1
Potassium	2320	J	1100	1480	J	1130	1680	J	1110	2340	J	1090	1870	J	1120
Selenium			0.53			0.54			0.54			0.52	0.58	J	1.1
Silver			0.43			0.46			0.45			0.44			0.45
Sodium	153	J	1070	230	UJ	1130	179	UJ	1110	186	UJ	1090	359	J	1120
Thallium			0.87			0.9			0.88			0.87			0.89
Vanadium	71.6		11	70.8		11.3	72.8		11.1	83.9		10.9	76.4		11.2
Zinc	85.6		4.4	78.7		4.5	78.9		4.4	83.1		4.4	86.3		4.5

Table C-2
LEHR Environmental Restoration
Metals Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC081			SSDTC082			SSDTC083			SSDTC084			SSDTC085		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
Aluminum	19700		45.2	22300		45	23400		42.6	19200		44	20400		45.6
Antimony		UJ	0.56		UJ	0.55		UJ	0.52		UJ	0.54		UJ	0.56
Arsenic	7.7		2.3	9		2.2	8.1		2.1	7.9		2.2	8.2		2.3
Barium	249		45.2	216		45	195		42.6	189		44	174		45.6
Beryllium	0.49	J	1.1	0.57	J	1.1	0.58	J	1.1	0.5	J	1.1	0.51	J	1.1
Cadmium			0.26			0.26			0.24			0.25			0.26
Calcium	6510		1130	5920		1120	3040		1060	4970		1100	5870		1140
Chromium	115		2.3	109		2.2	122		2.1	121		2.2	120		2.3
Chromium, Hexavalent	0.0575	UJ	0.23	0.0708	UJ	0.236	0.825		0.226			0.23			0.232
Cobalt	22.5		11.3	22.9		11.2	24.5		10.6	22.3		11	22.6		11.4
Copper	41.2		5.6	46.4		5.6	48		5.3	39.4		5.5	42.1		5.7
Iron	36600		22.6	39500		22.5	41500		21.3	37100		22	38400		22.8
Lead	6.8		0.68	7.7		0.68	7.4		0.64	6.9		0.66	7.5		0.68
Magnesium	23900		1130	23200		1120	21900		1060	25400		1100	26100		1140
Manganese	675		3.4	755		3.4	658		3.2	619		3.3	657		3.4
Mercury	0.18		0.032	0.18		0.037	0.27		0.036	0.14		0.033	0.13		0.038
Molybdenum	0.48	J	2.3	0.34	J	2.2	0.27	J	0.43	0.3	J	2.2	0.23	J	2.3
Nickel	230		9	218		9	242		8.5	239		8.8	240		9.1
Nitrate	824		6	909		11.9	244		2.32	485		5.9	55.1		1
Potassium	1430	J	1130	1750	J	1120	1780	J	1060	1370	J	1100	1470	J	1140
Selenium			0.54			0.54	0.58	J	1.1			0.53			0.55
Silver			0.46			0.45			0.43			0.44			0.46
Sodium	352	J	1130	496	J	1120	266	J	1060	295	J	1100	302	J	1140
Thallium			0.9			0.89			0.85			0.87			0.91
Vanadium	68.5		11.3	74.2		11.2	73.3		10.6	67.8		11	70.2		11.4
Zinc	74.2		4.5	83.5		4.5	80.6		4.2	72.8		4.4	77.3		4.6

Table C-2
LEHR Environmental Restoration
Metals Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC086			SSDTC087			SSDTC088			SSDTC089			SSDTC090		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
Aluminum	21400		44.8	23200		43.9	21200		44.6	21800		48.2	19400		44.6
Antimony		UJ	0.55		UJ	0.54		UJ	0.55	0.68	J	14.4	1	J	13.4
Arsenic	7.6		2.2	7.9		2.2	8.1		2.2	8.4		2.4	8.6		2.2
Barium	195		44.8	286		43.9	182		44.6	176		48.2	174		44.6
Beryllium	0.53	J	1.1	0.56	J	1.1	0.56	J	1.1	0.54	J	1.2	0.5	J	1.1
Cadmium			0.26			0.25			0.25			0.27			0.25
Calcium	4640		1120	15100		1100	3260		1120	2990		1200	3760		1110
Chromium	145		2.2	115		2.2	86.8		2.2	88.8		2.4	121		2.2
Chromium, Hexavalent	0.562		0.234	0.207		0.23	0.0826		0.236	0.104		0.232	0.0798		0.228
Cobalt	23.2		11.2	23.7		11	23.5		11.2	22.7		12	23.1		11.1
Copper	43.7		5.6	47.3		5.5	48	J	5.6	45.9	J	6	41.5	J	27.8
Iron	39500		22.4	39900		21.9	38700		22.3	37800		24.1	38700		22.3
Lead	6.9		0.67	7.3		0.66	7.8		0.67	7.6		0.72	7.3		0.67
Magnesium	19300		1120	29900		1100	17700		1120	16600		1200	26600		1110
Manganese	682		3.4	653		3.3	794		3.3	731		3.6	648		3.3
Mercury	0.13		0.033	0.14		0.036	0.19		0.04	0.1		0.035	0.18	J	0.034
Molybdenum	0.28	J	2.2	0.26	J	2.2	0.35	J	2.2	0.38	J	2.4	0.3	J	2.2
Nickel	233		9	232		8.8	193		8.9	182		9.6	246		8.9
Nitrate	366		3	188		1.16	243		2.44	216		1.2	0.777		1
Potassium	2250	J	1120	1670	J	1100	1850	J	1120	1950	J	1200	1410	J	1110
Selenium	0.62	J	1.1	0.59	J	1.1	0.96	J	1.1	1.6		1.2	1.4		1.1
Silver			0.45			0.44			0.45			0.49			0.45
Sodium	238	UJ	1120	248	J	1100	293	UJ	1120	490	UJ	1200	305	UJ	1110
Thallium	1.1	J	2.2			0.87			0.89			0.96	1.1	J	2.2
Vanadium	72.7		11.2	75.2		11	65.6		11.2	68.2		12	69.7		11.1
Zinc	79.8		4.5	82.1		4.4	85.3		4.5	81.6		4.8	73.4		4.4

Table C-3
LEHR Environmental Restoration
Pesticide Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC020			SSDTC021			SSDTC022			SSDTC024			SSDTC025		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
4,4'-DDD		UJ	3.5		UJ	3.5		UJ	3.6		UJ	3.5		UJ	3.5
4,4'-DDE		UJ	3.5		UJ	3.5		UJ	3.6	0.065	J	3.5		UJ	3.5
4,4'-DDT		UJ	3.5		UJ	3.5		UJ	3.6		UJ	3.5		UJ	3.5
Aldrin		UJ	1.8		UJ	1.8		UJ	1.8		UJ	1.8		UJ	1.7
alpha-BHC		UJ	1.8		UJ	1.8		UJ	1.8		UJ	1.8		UJ	1.7
Alpha-Chlordane	6.6	J	1.8		UJ	1.8		UJ	1.8	2.8	J	1.8	0.22	J	1.7
Arochlor-1016		UJ	35.3		UJ	35.3		UJ	35.7		UJ	35.3		UJ	34.6
Arochlor-1221		UJ	70.7		UJ	70.7		UJ	71.4		UJ	70.7		UJ	69.2
Arochlor-1232		UJ	35.3		UJ	35.3		UJ	35.7		UJ	35.3		UJ	34.6
Arochlor-1242		UJ	35.3		UJ	35.3		UJ	35.7		UJ	35.3		UJ	34.6
Arochlor-1248		UJ	35.3		UJ	35.3		UJ	35.7		UJ	35.3		UJ	34.6
Arochlor-1254		UJ	35.3		UJ	35.3		UJ	35.7		UJ	35.3		UJ	34.6
Arochlor-1260		UJ	35.3		UJ	35.3		UJ	35.7		UJ	35.3		UJ	34.6
Beta-BHC		UJ	1.8		UJ	1.8		UJ	1.8		UJ	1.8		UJ	1.7
Delta-BHC		UJ	1.8		UJ	1.8		UJ	1.8		UJ	1.8		UJ	1.7
Dieldrin		UJ	3.5		UJ	3.5		UJ	3.6		UJ	3.5		UJ	3.5
Endosulfan I		UJ	1.8		UJ	1.8		UJ	1.8		UJ	1.8		UJ	1.7
Endosulfan II		UJ	3.5		UJ	3.5		UJ	3.6		UJ	3.5		UJ	3.5
Endosulfan Sulfate		UJ	3.5		UJ	3.5		UJ	3.6		UJ	3.5		UJ	3.5
Endrin		UJ	3.5		UJ	3.5		UJ	3.6		UJ	3.5		UJ	3.5
Endrin Aldehyde		UJ	3.5		UJ	3.5		UJ	3.6		UJ	3.5		UJ	3.5
Endrin Ketone		UJ	3.5		UJ	3.5		UJ	3.6		UJ	3.5		UJ	3.5
gamma-BHC (Lindane)		UJ	1.8		UJ	1.8		UJ	1.8		UJ	1.8		UJ	1.7
gamma-Chlordane	4.7	J	1.8		UJ	1.8		UJ	1.8	3	J	1.8	0.12	J	1.7
Heptachlor		UJ	1.8		UJ	1.8		UJ	1.8		UJ	1.8		UJ	1.7
Heptachlor Epoxide		UJ	1.8		UJ	1.8		UJ	1.8		UJ	1.8		UJ	1.7
Methoxychlor		UJ	17.7		UJ	17.7		UJ	17.9		UJ	17.7		UJ	17.3
Toxaphene		UJ	177		UJ	177		UJ	179		UJ	177		UJ	173

Table C-3
LEHR Environmental Restoration
Pesticide Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC026			SSDTC027			SSDTC028			SSDTC029			SSDTC030		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
4,4'-DDD		UJ	3.5		UJ	3.5			3.6			3.7			3.6
4,4'-DDE		UJ	3.5		UJ	3.5			3.6			3.7			3.6
4,4'-DDT		UJ	3.5		UJ	3.5			3.6			3.7			3.6
Aldrin		UJ	1.7		UJ	1.7			1.8			1.8			1.8
alpha-BHC		UJ	1.7		UJ	1.7			1.8			1.8			1.8
Alpha-Chlordane		UJ	1.7	3	J	1.7	10.9		1.8			1.8	1.3	J	1.8
Arochlor-1016		UJ	34.6		UJ	35			35.7			36.9			35.7
Arochlor-1221		UJ	69.2		UJ	69.9			71.4			73.8			71.4
Arochlor-1232		UJ	34.6		UJ	35			35.7			36.9			35.7
Arochlor-1242		UJ	34.6		UJ	35			35.7			36.9			35.7
Arochlor-1248		UJ	34.6		UJ	35			35.7			36.9			35.7
Arochlor-1254	26.1	J	34.6		UJ	35			35.7			36.9			35.7
Arochlor-1260		UJ	34.6		UJ	35			35.7			36.9			35.7
Beta-BHC		UJ	1.7		UJ	1.7			1.8			1.8			1.8
Delta-BHC		UJ	1.7		UJ	1.7			1.8			1.8			1.8
Dieldrin		UJ	3.5		UJ	3.5			3.6			3.7			3.6
Endosulfan I		UJ	1.7		UJ	1.7			1.8			1.8			1.8
Endosulfan II		UJ	3.5		UJ	3.5			3.6			3.7			3.6
Endosulfan Sulfate		UJ	3.5		UJ	3.5			3.6			3.7			3.6
Endrin		UJ	3.5		UJ	3.5			3.6			3.7			3.6
Endrin Aldehyde		UJ	3.5		UJ	3.5			3.6			3.7			3.6
Endrin Ketone		UJ	3.5		UJ	3.5			3.6			3.7			3.6
gamma-BHC (Lindane)		UJ	1.7		UJ	1.7			1.8			1.8			1.8
gamma-Chlordane		UJ	1.7	1.6	J	1.7	11.4		1.8			1.8	1.2	J	1.8
Heptachlor		UJ	1.7		UJ	1.7			1.8			1.8			1.8
Heptachlor Epoxide		UJ	1.7		UJ	1.7			1.8			1.8			1.8
Methoxychlor		UJ	17.3		UJ	17.5			17.9			18.4			17.9
Toxaphene		UJ	173		UJ	175			179			184			179

Table C-3
LEHR Environmental Restoration
Pesticide Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC031			SSDTC031DL1			SSDTC032			SSDTC033			SSDTC034		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
4,4'-DDD			3.8			7.6			3.8			3.8			3.6
4,4'-DDE			3.8			7.6			3.8			3.8			3.6
4,4'-DDT			3.8			7.6			3.8			3.8			3.6
Aldrin			1.9			3.8			1.9			1.9			1.8
alpha-BHC			1.9			3.8			1.9			1.9			1.8
Alpha-Chlordane	33.2	J	1.9	36.3		3.8			1.9	8.4		1.9	22.4		1.8
Arochlor-1016			37.8			75.5			37.8			37.8			36.1
Arochlor-1221			75.5			151			75.5			75.5			72.2
Arochlor-1232			37.8			75.5			37.8			37.8			36.1
Arochlor-1242			37.8			75.5			37.8			37.8			36.1
Arochlor-1248			37.8			75.5			37.8			37.8			36.1
Arochlor-1254			37.8			75.5			37.8			37.8			36.1
Arochlor-1260			37.8			75.5			37.8			37.8			36.1
Beta-BHC			1.9			3.8			1.9			1.9			1.8
Delta-BHC			1.9			3.8			1.9			1.9			1.8
Dieldrin			3.8			7.6			3.8			3.8			3.6
Endosulfan I			1.9			3.8			1.9			1.9			1.8
Endosulfan II			3.8			7.6			3.8			3.8			3.6
Endosulfan Sulfate			3.8			7.6			3.8			3.8			3.6
Endrin			3.8			7.6			3.8			3.8			3.6
Endrin Aldehyde			3.8			7.6			3.8			3.8			3.6
Endrin Ketone			3.8			7.6			3.8			3.8			3.6
gamma-BHC (Lindane)			1.9			3.8			1.9			1.9			1.8
gamma-Chlordane	31.7	J	1.9	34.6		3.8			1.9	8.3		1.9	21.6		1.8
Heptachlor	3		1.9	3.1	J	3.8			1.9	1.5	J	1.9	2.7		1.8
Heptachlor Epoxide			1.9			3.8			1.9			1.9			1.8
Methoxychlor			18.9			37.8			18.9			18.9			18
Toxaphene			189			378			189			189			180

Table C-3
LEHR Environmental Restoration
Pesticide Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC035			SSDTC036			SSDTC037			SSDTC038			SSDTC039		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
4,4'-DDD			3.8			3.7			3.7			0.73			3.6
4,4'-DDE			3.8			3.7			3.7			0.73			3.6
4,4'-DDT			3.8			3.7			3.7			0.73			3.6
Aldrin			1.9			1.8			1.9			0.36			1.8
alpha-BHC			1.9			1.8			1.9			0.36			1.8
Alpha-Chlordane			1.9			1.8	10.1		1.9	0.24	J	0.36	5		1.8
Arochlor-1016			37.8			36.9			37.3			7.3			36.5
Arochlor-1221			75.5			73.8			74.6			7.3			73
Arochlor-1232			37.8			36.9			37.3			14.6			36.5
Arochlor-1242			37.8			36.9			37.3			7.3			36.5
Arochlor-1248			37.8			36.9			37.3			7.3			36.5
Arochlor-1254			37.8			36.9			37.3			7.3			36.5
Arochlor-1260			37.8			36.9			37.3			7.3			36.5
Beta-BHC			1.9			1.8			1.9			0.36			1.8
Delta-BHC			1.9			1.8			1.9			0.36			1.8
Dieldrin			3.8			3.7			3.7			0.73			3.6
Endosulfan I			1.9			1.8			1.9			0.36			1.8
Endosulfan II			3.8			3.7			3.7			0.73			3.6
Endosulfan Sulfate			3.8			3.7			3.7			0.73			3.6
Endrin			3.8			3.7			3.7			0.73			3.6
Endrin Aldehyde			3.8			3.7			3.7			0.73			3.6
Endrin Ketone			3.8			3.7			3.7			0.73			3.6
gamma-BHC (Lindane)			1.9			1.8			1.9			0.36			1.8
gamma-Chlordane			1.9			1.8	9.8		1.9	0.22	J	0.36	5.2		1.8
Heptachlor			1.9			1.8	1.4	J	1.9			0.36			1.8
Heptachlor Epoxide			1.9			1.8			1.9			0.36			1.8
Methoxychlor			18.9			18.4			18.7			3.6			18.2
Toxaphene			189			184			187			36.5			182

Table C-3
LEHR Environmental Restoration
Pesticide Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC040			SSDTC041			SSDTC041DL1			SSDTC042			SSDTC043		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
4,4'-DDD	1.4	UJ	3.7	11	J	3.6	18.9	J	36.5	2.2	UJ	3.6	3.5	UJ	3.8
4,4'-DDE	1.8	J	3.7	2.5	J	3.6	3.7	J	36.5	0.69	UJ	3.6	9.8		3.8
4,4'-DDT	22.1	UJ	3.7	273	J	3.6	276		36.5	24.7	UJ	3.6	48.9	UJ	3.8
Aldrin			1.9			1.8			18.2			1.8			1.9
alpha-BHC			1.9			1.8			18.2			1.8			1.9
Alpha-Chlordane	2		1.9	1.4	J	1.8			18.2	1.5	J	1.8	12.5		1.9
Arochlor-1016			37.3			36.5			365			36.5			37.8
Arochlor-1221			74.6			73			730			73			75.5
Arochlor-1232			37.3			36.5			365			36.5			37.8
Arochlor-1242			37.3			36.5			365			36.5			37.8
Arochlor-1248			37.3			36.5			365			36.5			37.8
Arochlor-1254			37.3			36.5			365			36.5			37.8
Arochlor-1260			37.3			36.5			365			36.5			37.8
Beta-BHC			1.9			1.8			18.2			1.8			1.9
Delta-BHC			1.9			1.8			18.2			1.8			1.9
Dieldrin			3.7			3.6			36.5			3.6			3.8
Endosulfan I			1.9			1.8			18.2			1.8			1.9
Endosulfan II			3.7			3.6			36.5			3.6			3.8
Endosulfan Sulfate			3.7			3.6			36.5			3.6			3.8
Endrin			3.7			3.6			36.5			3.6			3.8
Endrin Aldehyde			3.7			3.6			36.5			3.6			3.8
Endrin Ketone			3.7			3.6			36.5			3.6			3.8
gamma-BHC (Lindane)			1.9			1.8			18.2			1.8			1.9
gamma-Chlordane	1.8	J	1.9	1.3	J	1.8			18.2	1.4	J	1.8	13.2		1.9
Heptachlor			1.9			1.8			18.2			1.8	2.4		1.9
Heptachlor Epoxide			1.9			1.8			18.2			1.8			1.9
Methoxychlor			18.7			18.2			182			18.2			18.9
Toxaphene			187			182			1820			182			189

Table C-3
LEHR Environmental Restoration
Pesticide Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC044			SSDTC044DL1			SSDTC045			SSDTC045DL1			SSDTC046		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
4,4'-DDD	11.5	J	3.7	13.7	J	18.7	1.8	UJ	3.9	1.7	UJ	15.6	2.5	UJ	4
4,4'-DDE	3.8		3.7	4.4	J	18.7			3.9		UJ	15.6	2.4	J	4
4,4'-DDT	203	J	3.7	187		18.7	32	UJ	3.9	30.6		15.6	41.8	UJ	4
Aldrin			1.9			9.3			2			7.8			2
alpha-BHC			1.9			9.3			2			7.8			2
Alpha-Chlordane	14.5		1.9	13.9		9.3	61.2	J	2	57.8		7.8	5		2
Arochlor-1016			37.3			187			39.1			156			39.6
Arochlor-1221			74.6			373			78.2			313			79.1
Arochlor-1232			37.3			187			39.1			156			39.6
Arochlor-1242			37.3			187			39.1			156			39.6
Arochlor-1248			37.3			187			39.1			156			39.6
Arochlor-1254			37.3			187			39.1			156			39.6
Arochlor-1260			37.3			187			39.1			156	9.7	J	39.6
Beta-BHC			1.9			9.3			2			7.8			2
Delta-BHC			1.9			9.3			2			7.8			2
Dieldrin			3.7			18.7			3.9			15.6			4
Endosulfan I			1.9			9.3			2			7.8			2
Endosulfan II			3.7			18.7			3.9			15.6			4
Endosulfan Sulfate			3.7			18.7			3.9			15.6			4
Endrin			3.7			18.7			3.9			15.6			4
Endrin Aldehyde			3.7			18.7			3.9			15.6			4
Endrin Ketone			3.7			18.7			3.9			15.6			4
gamma-BHC (Lindane)			1.9			9.3			2			7.8			2
gamma-Chlordane	16		1.9	15.1		9.3	59.1	J	2	55.4		7.8	5.6		2
Heptachlor	1.5	J	1.9			9.3	16.7		2	16.7		7.8	0.74	J	2
Heptachlor Epoxide			1.9			9.3			2			7.8			2
Methoxychlor			18.7			93.3			19.5			78.2			19.8
Toxaphene			187			933			195			782			198

Table C-3
LEHR Environmental Restoration
Pesticide Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC047			SSDTC047DL1			SSDTC048			SSDTC049			SSDTC050		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
4,4'-DDD	1.6	UJ	3.7			37.3	0.41	UJ	3.9	0.51	UJ	3.8			4
4,4'-DDE			3.7			37.3	0.34	UJ	3.9			3.8			4
4,4'-DDT	24	UJ	3.7	22.2	UJ	37.3	7.5	UJ	3.9	9	UJ	3.8	15.4	UJ	4
Aldrin			1.9			18.7			2			1.9			2
alpha-BHC			1.9			18.7			2			1.9			2
Alpha-Chlordane	14.9		1.9	14.7		18.7	0.63	J	2			1.9			2
Arochlor-1016			37.3			373			39.1			38.2			39.6
Arochlor-1221			74.6			746			78.2			76.4			79.1
Arochlor-1232			37.3			373			39.1			38.2			39.6
Arochlor-1242			37.3			373			39.1			38.2			39.6
Arochlor-1248			37.3			373			39.1			38.2			39.6
Arochlor-1254			37.3			373			39.1			38.2			39.6
Arochlor-1260			37.3			373			39.1			38.2			39.6
Beta-BHC			1.9			18.7			2			1.9			2
Delta-BHC			1.9			18.7			2			1.9			2
Dieldrin			3.7			37.3			3.9			3.8			4
Endosulfan I			1.9			18.7			2			1.9			2
Endosulfan II			3.7			37.3			3.9			3.8			4
Endosulfan Sulfate			3.7			37.3			3.9			3.8			4
Endrin			3.7			37.3			3.9			3.8			4
Endrin Aldehyde			3.7			37.3			3.9			3.8			4
Endrin Ketone			3.7			37.3			3.9			3.8			4
gamma-BHC (Lindane)			1.9			18.7			2			1.9			2
gamma-Chlordane	13.5		1.9	13.1		18.7	0.72	J	2			1.9			2
Heptachlor	1.2	J	1.9			18.7			2			1.9			2
Heptachlor Epoxide			1.9			18.7			2			1.9			2
Methoxychlor			18.7			187			19.5			19.1			19.8
Toxaphene			187			1870			195			191			198

Table C-3
LEHR Environmental Restoration
Pesticide Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC051			SSDTC052			SSDTC053			SSDTC054			SSDTC055		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
4,4'-DDD	0.21	UJ	3.8			3.9	0.37	UJ	3.6	0.46	UJ	3.9	0.3	UJ	3.7
4,4'-DDE			3.8			3.9	0.5	UJ	3.6			3.9	0.48	UJ	3.7
4,4'-DDT	9.2	UJ	3.8	6.2	UJ	3.9	5.4	UJ	3.6	6	UJ	3.9	5.2	UJ	3.7
Aldrin			1.9			1.9			1.8			1.9			1.9
alpha-BHC			1.9			1.9			1.8			1.9			1.9
Alpha-Chlordane			1.9			1.9			1.8			1.9	1.9		1.9
Arochlor-1016			37.8			38.6			36.1			38.6			37.3
Arochlor-1221			75.5			77.3			72.2			77.3			74.6
Arochlor-1232			37.8			38.6			36.1			38.6			37.3
Arochlor-1242			37.8			38.6			36.1			38.6			37.3
Arochlor-1248			37.8			38.6			36.1			38.6			37.3
Arochlor-1254			37.8			38.6			36.1			38.6			37.3
Arochlor-1260			37.8			38.6			36.1			38.6			37.3
Beta-BHC			1.9			1.9			1.8			1.9			1.9
Delta-BHC			1.9			1.9			1.8			1.9			1.9
Dieldrin			3.8			3.9			3.6			3.9			3.7
Endosulfan I			1.9			1.9			1.8			1.9			1.9
Endosulfan II			3.8			3.9			3.6			3.9			3.7
Endosulfan Sulfate			3.8			3.9			3.6			3.9			3.7
Endrin			3.8			3.9			3.6			3.9			3.7
Endrin Aldehyde			3.8			3.9			3.6			3.9			3.7
Endrin Ketone			3.8			3.9			3.6			3.9			3.7
gamma-BHC (Lindane)			1.9			1.9			1.8			1.9			1.9
gamma-Chlordane			1.9			1.9			1.8			1.9	2		1.9
Heptachlor			1.9			1.9			1.8			1.9			1.9
Heptachlor Epoxide			1.9			1.9			1.8			1.9			1.9
Methoxychlor			18.9			19.3	9.6	UJ	18			19.3			18.7
Toxaphene			189			193			180			193			187

Table C-3
LEHR Environmental Restoration
Pesticide Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC056			SSDTC057			SSDTC058			SSDTC058DL1			SSDTC059		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
4,4'-DDD	0.85	UJ	3.9	0.82	UJ	3.9			3.6			36.4	1.6	UJ	3.7
4,4'-DDE			3.9			3.9			3.6			36.4	8.2		3.7
4,4'-DDT	10.2	UJ	3.9	10.4	UJ	3.9			3.6	11.2	UJ	36.4	16.8	UJ	3.7
Aldrin			1.9			1.9			1.8			18.2			1.9
alpha-BHC			1.9			1.9			1.8			18.2			1.9
Alpha-Chlordane	1.6	J	1.9	1.3	J	1.9	113	J	1.8	110		18.2	13.8		1.9
Arochlor-1016			38.6			38.6			36.4			364			37.2
Arochlor-1221			77.3			77.3			72.8			728			74.4
Arochlor-1232			38.6			38.6			36.4			364			37.2
Arochlor-1242			38.6			38.6			36.4			364			37.2
Arochlor-1248			38.6			38.6			36.4			364			37.2
Arochlor-1254			38.6			38.6			36.4			364			37.2
Arochlor-1260			38.6			38.6			36.4			364			37.2
Beta-BHC			1.9			1.9			1.8			18.2			1.9
Delta-BHC			1.9			1.9			1.8			18.2			1.9
Dieldrin			3.9			3.9			3.6			36.4			3.7
Endosulfan I			1.9			1.9			1.8			18.2			1.9
Endosulfan II			3.9			3.9			3.6			36.4			3.7
Endosulfan Sulfate			3.9			3.9			3.6			36.4			3.7
Endrin			3.9			3.9			3.6			36.4			3.7
Endrin Aldehyde			3.9			3.9			3.6			36.4			3.7
Endrin Ketone			3.9			3.9			3.6			36.4			3.7
gamma-BHC (Lindane)			1.9			1.9			1.8			18.2			1.9
gamma-Chlordane	1.6	J	1.9	1.3	J	1.9	97.6	J	1.8	94.8		18.2	10.6		1.9
Heptachlor			1.9			1.9	3.2		1.8	2.9	J	18.2	1.4	J	1.9
Heptachlor Epoxide			1.9			1.9			1.8			18.2			1.9
Methoxychlor			19.3			19.3			18.2			182			18.6
Toxaphene			193			193			182			1820			186

Table C-3
LEHR Environmental Restoration
Pesticide Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC060			SSDTC061			SSDTC062			SSDTC063			SSDTC064		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
4,4'-DDD	1.7	UJ	3.8	3.3	J	3.8	3.5	J	3.8	0.083	UJ	3.8	0.6	UJ	3.8
4,4'-DDE	2.4	J	3.8	9.1		3.8	26.8		3.8	1.5	J	3.8	3.7		3.8
4,4'-DDT	10.7	UJ	3.8	35.9		3.8	43		3.8	5	UJ	3.8	7.6	UJ	3.8
Aldrin			1.9			1.9			1.9			1.9			1.9
alpha-BHC			1.9			1.9			1.9			1.9			1.9
Alpha-Chlordane	15.8		1.9	19		1.9			1.9	3.5		1.9			1.9
Arochlor-1016			37.6			37.6			38.1			38.5			38.5
Arochlor-1221			75.2			75.2			76.1			77			77
Arochlor-1232			37.6			37.6			38.1			38.5			38.5
Arochlor-1242			37.6			37.6			38.1			38.5			38.5
Arochlor-1248			37.6			37.6			38.1			38.5			38.5
Arochlor-1254			37.6			37.6			38.1			38.5	9.8	J	38.5
Arochlor-1260			37.6			37.6			38.1			38.5			38.5
Beta-BHC			1.9			1.9			1.9			1.9			1.9
Delta-BHC			1.9			1.9			1.9			1.9			1.9
Dieldrin			3.8			3.8			3.8			3.8			3.8
Endosulfan I			1.9			1.9			1.9			1.9			1.9
Endosulfan II			3.8			3.8			3.8			3.8			3.8
Endosulfan Sulfate			3.8			3.8			3.8			3.8			3.8
Endrin			3.8			3.8			3.8			3.8			3.8
Endrin Aldehyde			3.8			3.8			3.8			3.8			3.8
Endrin Ketone			3.8			3.8			3.8			3.8			3.8
gamma-BHC (Lindane)			1.9			1.9			1.9			1.9			1.9
gamma-Chlordane	13.5		1.9	16.7		1.9			1.9	3.4		1.9			1.9
Heptachlor			1.9			1.9			1.9			1.9			1.9
Heptachlor Epoxide			1.9			1.9			1.9			1.9			1.9
Methoxychlor			18.8			18.8			19			19.2			19.2
Toxaphene			188			188			190			192			192

Table C-3
LEHR Environmental Restoration
Pesticide Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC065			SSDTC066			SSDTC067			SSDTC068			SSDTC069		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
4,4'-DDD	1.1	UJ	3.8	0.61	UJ	3.8	0.33	UJ	3.9	0.14	UJ	3.7	2.6	J	3.7
4,4'-DDE	6.5		3.8	5.2		3.8	1.8	J	3.9	0.95		3.7	11.9		3.7
4,4'-DDT	13.5	UJ	3.8	7	UJ	3.8	4.8	UJ	3.9	4.8	UJ	3.7	25.6	UJ	3.7
Aldrin			1.9			1.9			1.9			1.9			1.9
alpha-BHC			1.9			1.9			1.9			1.9			1.9
Alpha-Chlordane	0.89	J	1.9	1.6	J	1.9			1.9	0.34	J	1.9	2.8		1.9
Arochlor-1016			38.1			37.6			39			37.2			37.2
Arochlor-1221			76.1			75.2			77.9			74.4			74.4
Arochlor-1232			38.1			37.6			39			37.2			37.2
Arochlor-1242			38.1			37.6			39			37.2			37.2
Arochlor-1248			38.1			37.6			39			37.2			37.2
Arochlor-1254			38.1			37.6			39			37.2			37.2
Arochlor-1260			38.1			37.6			39			37.2			37.2
Beta-BHC			1.9			1.9			1.9			1.9			1.9
Delta-BHC			1.9			1.9			1.9			1.9			1.9
Dieldrin			3.8			3.8			3.9			3.7			3.7
Endosulfan I			1.9			1.9			1.9			1.9			1.9
Endosulfan II			3.8			3.8			3.9			3.7			3.7
Endosulfan Sulfate			3.8			3.8			3.9			3.7			3.7
Endrin			3.8			3.8			3.9			3.7			3.7
Endrin Aldehyde			3.8			3.8			3.9			3.7			3.7
Endrin Ketone			3.8			3.8			3.9			3.7			3.7
gamma-BHC (Lindane)			1.9			1.9			1.9			1.9			1.9
gamma-Chlordane	0.97	J	1.9	2		1.9			1.9	0.31	J	1.9	2.2		1.9
Heptachlor			1.9			1.9			1.9			1.9			1.9
Heptachlor Epoxide			1.9			1.9			1.9			1.9			1.9
Methoxychlor			19			18.8			19.5			18.6			18.6
Toxaphene			190			188			195			186			186

Table C-3
LEHR Environmental Restoration
Pesticide Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC070			SSDTC071			SSDTC072			SSDTC073			SSDTC074		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
4,4'-DDD	0.68	UJ	3.9	0.31	UJ	3.8			3.8	0.033	UJ	3.8	0.27	UJ	3.6
4,4'-DDE	1.6	J	3.9	1.3	J	3.8	1.2	J	3.8	0.55	J	3.8	0.33	J	3.6
4,4'-DDT	11.3	UJ	3.9	4.1	UJ	3.8	3.7	UJ	3.8	2.8	UJ	3.8	2.6	UJ	3.6
Aldrin			1.9			1.9			1.9			1.9			1.8
alpha-BHC			1.9			1.9			1.9			1.9			1.8
Alpha-Chlordane	1.1	J	1.9	6.3		1.9	10		1.9	1.8	J	1.9	0.17	J	1.8
Arochlor-1016			39			37.6			38.1			38.5			35.6
Arochlor-1221			77.9			75.2			76.1			77			71.2
Arochlor-1232			39			37.6			38.1			38.5			35.6
Arochlor-1242			39			37.6			38.1			38.5			35.6
Arochlor-1248			39			37.6			38.1			38.5			35.6
Arochlor-1254			39			37.6			38.1			38.5			35.6
Arochlor-1260			39			37.6			38.1			38.5			35.6
Beta-BHC			1.9			1.9			1.9			1.9			1.8
Delta-BHC			1.9			1.9	0.12	J	1.9			1.9			1.8
Dieldrin			3.9			3.8	0.63	J	3.8			3.8			3.6
Endosulfan I			1.9			1.9			1.9			1.9			1.8
Endosulfan II			3.9			3.8			3.8			3.8			3.6
Endosulfan Sulfate			3.9			3.8	0.086	J	3.8			3.8			3.6
Endrin			3.9			3.8			3.8			3.8			3.6
Endrin Aldehyde			3.9			3.8			3.8			3.8			3.6
Endrin Ketone			3.9			3.8			3.8			3.8			3.6
gamma-BHC (Lindane)			1.9			1.9			1.9			1.9			1.8
gamma-Chlordane	1.1	J	1.9	6.2		1.9	9.6		1.9	1.8	J	1.9	0.14	J	1.8
Heptachlor			1.9			1.9	0.2	J	1.9			1.9			1.8
Heptachlor Epoxide			1.9			1.9			1.9			1.9			1.8
Methoxychlor			19.5			18.8			19			19.2			17.8
Toxaphene			195			188			190			192			178

Table C-3
LEHR Environmental Restoration
Pesticide Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC075			SSDTC076			SSDTC077			SSDTC078			SSDTC079		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
4,4'-DDD	0.49	UJ	3.6	0.066	UJ	3.7	0.84	UJ	3.8	1.2	UJ	3.9	1	UJ	3.8
4,4'-DDE	1.1	J	3.6			3.7	0.4	J	3.8	1.1	J	3.9			3.8
4,4'-DDT	5.8	UJ	3.6	3.1	UJ	3.7	9.2	UJ	3.8	3.9	UJ	3.9	3.4	UJ	3.8
Aldrin			1.8			1.8			1.9			2			1.9
alpha-BHC			1.8			1.8			1.9			2			1.9
Alpha-Chlordane			1.8			1.8	0.6	J	1.9	0.82	J	2	0.69	J	1.9
Arochlor-1016			35.6			36.8			38.6			39			38.6
Arochlor-1221			71.2			73.6			77.1			78.1			77.1
Arochlor-1232			35.6			36.8			38.6			39			38.6
Arochlor-1242			35.6			36.8			38.6			39			38.6
Arochlor-1248			35.6			36.8			38.6			39			38.6
Arochlor-1254			35.6	4.5	J	36.8			38.6			39			38.6
Arochlor-1260			35.6			36.8			38.6			39			38.6
Beta-BHC			1.8			1.8			1.9			2			1.9
Delta-BHC			1.8			1.8			1.9			2			1.9
Dieldrin			3.6			3.7			3.8			3.9			3.8
Endosulfan I			1.8			1.8			1.9			2			1.9
Endosulfan II			3.6			3.7			3.8			3.9			3.8
Endosulfan Sulfate			3.6			3.7			3.8			3.9			3.8
Endrin			3.6			3.7			3.8			3.9			3.8
Endrin Aldehyde			3.6			3.7			3.8			3.9			3.8
Endrin Ketone			3.6			3.7			3.8			3.9			3.8
gamma-BHC (Lindane)			1.8			1.8			1.9			2			1.9
gamma-Chlordane			1.8			1.8	0.62	J	1.9	0.61	J	2	0.77	J	1.9
Heptachlor			1.8			1.8			1.9			2			1.9
Heptachlor Epoxide			1.8			1.8			1.9			2			1.9
Methoxychlor			17.8			18.4			19.3			19.5			19.3
Toxaphene			178			184			193			195			193

Table C-3
LEHR Environmental Restoration
Pesticide Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC080			SSDTC081			SSDTC081DL1			SSDTC082			SSDTC083		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
4,4'-DDD	0.83	UJ	4	11.3		3.8	13.5	J	15.4	0.55	UJ	4	0.27	UJ	3.8
4,4'-DDE			4	0.97	J	3.8	1.1	J	15.4	0.12	J	4			3.8
4,4'-DDT	3	UJ	4	124	J	3.8	108		15.4	4.7	UJ	4	2.2	UJ	3.8
Aldrin			2			1.9			7.7			2			1.9
alpha-BHC			2			1.9			7.7			2			1.9
Alpha-Chlordane	0.42	J	2	2.6		1.9	2.8	J	7.7	0.5	J	2			1.9
Arochlor-1016			39.5			38.6			154			39.5			37.7
Arochlor-1221			79			77.1			308			79			75.4
Arochlor-1232			39.5			38.6			154			39.5			37.7
Arochlor-1242			39.5			38.6			154			39.5			37.7
Arochlor-1248			39.5			38.6			154			39.5			37.7
Arochlor-1254			39.5			38.6			154			39.5			37.7
Arochlor-1260			39.5			38.6			154			39.5			37.7
Beta-BHC			2			1.9			7.7			2			1.9
Delta-BHC			2			1.9			7.7			2			1.9
Dieldrin			4			3.8			15.4			4			3.8
Endosulfan I			2			1.9			7.7			2			1.9
Endosulfan II			4			3.8			15.4			4			3.8
Endosulfan Sulfate			4			3.8			15.4			4			3.8
Endrin			4			3.8			15.4			4			3.8
Endrin Aldehyde			4			3.8			15.4			4			3.8
Endrin Ketone			4			3.8			15.4			4			3.8
gamma-BHC (Lindane)			2			1.9			7.7			2			1.9
gamma-Chlordane	0.61	J	2	2.8		1.9	2.9	J	7.7	0.54	J	2			1.9
Heptachlor			2			1.9			7.7			2			1.9
Heptachlor Epoxide			2			1.9			7.7			2			1.9
Methoxychlor			19.8			19.3			77.1			19.8			18.8
Toxaphene			198			193			771			198			188

Table C-3
LEHR Environmental Restoration
Pesticide Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC084			SSDTC085			SSDTC086			SSDTC087			SSDTC088		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
4,4'-DDD	0.73	UJ	3.8	0.12	UJ	3.8	1.1	UJ	3.8	0.097	UJ	3.8	0.85	UJ	4
4,4'-DDE			3.8	0.21	J	3.8	0.42	J	3.8	0.088	J	3.8			4
4,4'-DDT	5.3	UJ	3.8	2.5	UJ	3.8	12	UJ	3.8	2.6	UJ	3.8	8.8	UJ	4
Aldrin			1.9			1.9			1.9			1.9			2
alpha-BHC			1.9			1.9			1.9			1.9			2
Alpha-Chlordane			1.9	5.7		1.9	0.76	J	1.9			1.9	0.42	J	2
Arochlor-1016			38.6			38.1			38.6			38.1			39.5
Arochlor-1221			77.1			76.2			77.1			76.2			79
Arochlor-1232			38.6			38.1			38.6			38.1			39.5
Arochlor-1242			38.6			38.1			38.6			38.1			39.5
Arochlor-1248			38.6			38.1			38.6			38.1			39.5
Arochlor-1254			38.6			38.1			38.6			38.1			39.5
Arochlor-1260			38.6			38.1			38.6			38.1			39.5
Beta-BHC			1.9			1.9			1.9			1.9			2
Delta-BHC			1.9			1.9			1.9			1.9			2
Dieldrin			3.8			3.8			3.8			3.8			4
Endosulfan I			1.9			1.9			1.9			1.9			2
Endosulfan II			3.8			3.8			3.8			3.8			4
Endosulfan Sulfate			3.8			3.8			3.8			3.8			4
Endrin			3.8			3.8			3.8			3.8			4
Endrin Aldehyde			3.8			3.8			3.8			3.8			4
Endrin Ketone			3.8			3.8			3.8			3.8			4
gamma-BHC (Lindane)			1.9			1.9			1.9			1.9			2
gamma-Chlordane			1.9	5.1		1.9	0.78	J	1.9			1.9	0.44	J	2
Heptachlor			1.9			1.9			1.9			1.9			2
Heptachlor Epoxide			1.9			1.9			1.9			1.9			2
Methoxychlor			19.3			19.1			19.3			19.1			19.8
Toxaphene			193			191			193			191			198

Table C-3
LEHR Environmental Restoration
Pesticide Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC089			SSDTC090		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
4,4'-DDD	5.4	UJ	4	0.39	UJ	3.8
4,4'-DDE	5.4		4	0.48	UJ	3.8
4,4'-DDT	51		4	4	UJ	3.8
Aldrin			2			1.9
alpha-BHC			2			1.9
Alpha-Chlordane	0.58	Jq	2	0.71	J	1.9
Arochlor-1016			39.5			37.9
Arochlor-1221			79			75.8
Arochlor-1232			39.5			37.9
Arochlor-1242			39.5			37.9
Arochlor-1248			39.5			37.9
Arochlor-1254			39.5			37.9
Arochlor-1260			39.5			37.9
Beta-BHC			2			1.9
Delta-BHC			2			1.9
Dieldrin			4			3.8
Endosulfan I			2			1.9
Endosulfan II			4			3.8
Endosulfan Sulfate			4			3.8
Endrin			4			3.8
Endrin Aldehyde			4			3.8
Endrin Ketone			4			3.8
gamma-BHC (Lindane)			2			1.9
gamma-Chlordane	0.52	Jq	2	0.64	J	1.9
Heptachlor			2			1.9
Heptachlor Epoxide			2			1.9
Methoxychlor			19.8			18.9
Toxaphene			198			189

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC020			SSDTC021			SSDTC022			SSDTC024			SSDTC025		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			10.6			10.6			10.8			10.6			10.4
1,1,2,2-Tetrachloroethane			10.6			10.6			10.8			10.6			10.4
1,1,2-Trichloroethane			10.6			10.6			10.8			10.6			10.4
1,1-Dichloroethane			10.6			10.6			10.8			10.6			10.4
1,1-Dichloroethene			10.6			10.6			10.8			10.6			10.4
1,2-Dichloroethane			10.6			10.6			10.8			10.6			10.4
1,2-Dichloroethene (total)			10.6			10.6			10.8			10.6			10.4
1,2-Dichloropropane			10.6			10.6			10.8			10.6			10.4
2-Butanone			10.6			10.6	3.92	J	10.8			10.6			10.4
2-Hexanone			10.6			10.6			10.8			10.6			10.4
4-Methyl-2-Pentanone			10.6			10.6			10.8			10.6			10.4
Acetone			10.6			10.6	3.73	UJ	10.8			10.6	1.85	UJ	10.4
Benzene			10.6			10.6			10.8			10.6			10.4
Bromoform			10.6			10.6			10.8			10.6			10.4
Carbon Disulfide			10.6			10.6			10.8			10.6			10.4
Carbon Tetrachloride			10.6			10.6			10.8			10.6			10.4
Chlorobenzene			10.6			10.6			10.8			10.6			10.4
Chlorodibromomethane			10.6			10.6			10.8			10.6			10.4
Chloroethane		UJ	10.6		UJ	10.6		UJ	10.8		UJ	10.6		UJ	10.4
Chloroform			10.6			10.6			10.8			10.6			10.4
cis-1,3-Dichloropropylene			10.6			10.6			10.8			10.6			10.4
Dichlorobromomethane			10.6			10.6			10.8			10.6			10.4
Ethylbenzene			10.6			10.6			10.8			10.6			10.4
Methyl Bromide		UJ	10.6	0.693	J	10.6		UJ	10.8		UJ	10.6		UJ	10.4
Methyl Chloride			10.6			10.6			10.8			10.6			10.4
Methylene Chloride	9.69	UJ	10.6	8.19	UJ	10.6	15	UJ	10.8	5.61	UJ	10.6	14.9	UJ	10.4
Styrene			10.6			10.6			10.8			10.6			10.4
Tetrachloroethylene			10.6			10.6			10.8			10.6			10.4
Toluene	2.13	J	10.6			10.6			10.8			10.6	1.15	J	10.4
trans-1,3-Dichloropropene			10.6			10.6			10.8			10.6			10.4
Trichloroethene			10.6			10.6			10.8			10.6			10.4
Vinyl Chloride			10.6			10.6			10.8			10.6			10.4
Xylenes (Total)			10.6			10.6			10.8			10.6	0.534	J	10.4

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC026			SSDTC027			SSDTC028			SSDTC029			SSDTC030		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			10.4			10.5			10.8			11.1			10.8
1,1,2,2-Tetrachloroethane			10.4			10.5			10.8			11.1			10.8
1,1,2-Trichloroethane			10.4			10.5			10.8			11.1			10.8
1,1-Dichloroethane			10.4			10.5			10.8			11.1			10.8
1,1-Dichloroethene			10.4			10.5			10.8			11.1			10.8
1,2-Dichloroethane			10.4			10.5			10.8			11.1			10.8
1,2-Dichloroethene (total)			10.4			10.5			10.8			11.1			10.8
1,2-Dichloropropane			10.4			10.5			10.8			11.1			10.8
2-Butanone			10.4			10.5			10.8			11.1			10.8
2-Hexanone			10.4			10.5			10.8			11.1			10.8
4-Methyl-2-Pentanone			10.4			10.5			10.8			11.1			10.8
Acetone	5.04	UJ	10.4			10.5			10.8			11.1			10.8
Benzene			10.4			10.5			10.8			11.1			10.8
Bromoform			10.4			10.5			10.8			11.1			10.8
Carbon Disulfide			10.4			10.5			10.8			11.1			10.8
Carbon Tetrachloride			10.4			10.5			10.8			11.1			10.8
Chlorobenzene			10.4			10.5			10.8			11.1			10.8
Chlorodibromomethane			10.4			10.5			10.8			11.1			10.8
Chloroethane		UJ	10.4		UJ	10.5		UJ	10.8		UJ	11.1		UJ	10.8
Chloroform			10.4			10.5			10.8			11.1			10.8
cis-1,3-Dichloropropylene			10.4			10.5			10.8			11.1			10.8
Dichlorobromomethane			10.4			10.5			10.8			11.1			10.8
Ethylbenzene			10.4	0.577	J	10.5			10.8			11.1			10.8
Methyl Bromide		UJ	10.4		UJ	10.5			10.8		UJ	11.1		UJ	10.8
Methyl Chloride			10.4			10.5			10.8			11.1			10.8
Methylene Chloride	15.4	UJ	10.4	15.3	UJ	10.5	16.6	UJ	10.8	13.2	UJ	11.1	15.7	UJ	10.8
Styrene			10.4			10.5			10.8			11.1			10.8
Tetrachloroethylene			10.4	0.916	J	10.5			10.8			11.1			10.8
Toluene	2.62	J	10.4	0.878	J	10.5	0.869	J	10.8	1.64	J	11.1	0.723	J	10.8
trans-1,3-Dichloropropene			10.4			10.5			10.8			11.1			10.8
Trichloroethene			10.4			10.5			10.8			11.1			10.8
Vinyl Chloride			10.4			10.5			10.8			11.1			10.8
Xylenes (Total)	1.88	J	10.4	1.98	J	10.5			10.8			11.1			10.8

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC031			SSDTC032			SSDTC033			SSDTC034			SSDTC035		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			11.4			11.4			11.4			10.9			11.4
1,1,2,2-Tetrachloroethane			11.4			11.4			11.4			10.9			11.4
1,1,2-Trichloroethane			11.4			11.4			11.4			10.9			11.4
1,1-Dichloroethane			11.4			11.4			11.4			10.9			11.4
1,1-Dichloroethene			11.4			11.4			11.4			10.9			11.4
1,2-Dichloroethane			11.4			11.4			11.4			10.9			11.4
1,2-Dichloroethene (total)			11.4			11.4			11.4			10.9			11.4
1,2-Dichloropropane			11.4			11.4			11.4			10.9			11.4
2-Butanone			11.4			11.4			11.4			10.9			11.4
2-Hexanone			11.4			11.4			11.4			10.9			11.4
4-Methyl-2-Pentanone			11.4			11.4			11.4			10.9			11.4
Acetone			11.4			11.4			11.4			10.9			11.4
Benzene			11.4			11.4			11.4			10.9			11.4
Bromoform			11.4			11.4			11.4			10.9			11.4
Carbon Disulfide			11.4			11.4			11.4			10.9			11.4
Carbon Tetrachloride			11.4			11.4			11.4			10.9			11.4
Chlorobenzene			11.4			11.4			11.4			10.9			11.4
Chlorodibromomethane			11.4			11.4			11.4			10.9			11.4
Chloroethane		UJ	11.4		UJ	11.4		UJ	11.4		UJ	10.9		UJ	11.4
Chloroform			11.4			11.4			11.4			10.9			11.4
cis-1,3-Dichloropropylene			11.4			11.4			11.4			10.9			11.4
Dichlorobromomethane			11.4			11.4			11.4			10.9			11.4
Ethylbenzene			11.4			11.4			11.4			10.9			11.4
Methyl Bromide		UJ	11.4		UJ	11.4		UJ	11.4		UJ	10.9		UJ	11.4
Methyl Chloride			11.4			11.4			11.4			10.9			11.4
Methylene Chloride	6.94	UJ	11.4	6.83	UJ	11.4	9.02	UJ	11.4	6.02	UJ	10.9	7.85	UJ	11.4
Styrene			11.4			11.4			11.4			10.9			11.4
Tetrachloroethylene			11.4			11.4			11.4			10.9			11.4
Toluene			11.4	0.75	J	11.4			11.4	11.1		10.9	4.66	J	11.4
trans-1,3-Dichloropropene			11.4			11.4			11.4			10.9			11.4
Trichloroethene			11.4			11.4			11.4			10.9			11.4
Vinyl Chloride			11.4			11.4			11.4			10.9			11.4
Xylenes (Total)			11.4			11.4			11.4	4.88	J	10.9	2.26	J	11.4

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC036			SSDTC036DL1			SSDTC037			SSDTC038			SSDTC038DL1		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			11.1			55.6			56.2			11			22
1,1,2,2-Tetrachloroethane			11.1			55.6			56.2			11			22
1,1,2-Trichloroethane			11.1			55.6			56.2			11			22
1,1-Dichloroethane			11.1			55.6			56.2			11			22
1,1-Dichloroethene			11.1			55.6			56.2			11			22
1,2-Dichloroethane			11.1			55.6			56.2			11			22
1,2-Dichloroethene (total)			11.1			55.6			56.2			11			22
1,2-Dichloropropane			11.1			55.6			56.2			11			22
2-Butanone			11.1			55.6			56.2			11			22
2-Hexanone			11.1			55.6			56.2			11			22
4-Methyl-2-Pentanone			11.1			55.6			56.2			11			22
Acetone			11.1			55.6			56.2			11	11.4	UJ	22
Benzene			11.1			55.6			56.2			11			22
Bromoform			11.1			55.6			56.2			11			22
Carbon Disulfide			11.1			55.6			56.2			11			22
Carbon Tetrachloride		UJ	11.1			55.6			56.2			11		UJ	22
Chlorobenzene			11.1			55.6			56.2			11			22
Chlorodibromomethane			11.1			55.6			56.2			11			22
Chloroethane		UJ	11.1		UJ	55.6		UJ	56.2		UJ	11		UJ	22
Chloroform			11.1			55.6			56.2			11			22
cis-1,3-Dichloropropylene			11.1			55.6			56.2			11			22
Dichlorobromomethane			11.1			55.6			56.2			11			22
Ethylbenzene	2.51	J	11.1			55.6			56.2			11			22
Methyl Bromide		UJ	11.1		UJ	55.6		UJ	56.2		UJ	11		UJ	22
Methyl Chloride			11.1			55.6			56.2			11			22
Methylene Chloride	6.26	UJ	11.1	31	UJ	55.6	29.3	UJ	56.2	7.45	UJ	11	12.6	UJ	22
Styrene			11.1			55.6			56.2			11			22
Tetrachloroethylene			11.1			55.6			56.2			11			22
Toluene	760	J	11.1	222	J	55.6	3.42	J	56.2	256	J	11	45.7		22
trans-1,3-Dichloropropene			11.1			55.6			56.2			11			22
Trichloroethene			11.1			55.6			56.2			11			22
Vinyl Chloride			11.1			55.6			56.2			11			22
Xylenes (Total)	10.6	J	11.1	3.81	J	55.6			56.2	3.64	J	11			22

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC039			SSDTC040			SSDTC041			SSDTC041DL1			SSDTC042		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			11			10			10			50			10
1,1,2,2-Tetrachloroethane			11			10			10			50			10
1,1,2-Trichloroethane			11			10			10			50			10
1,1-Dichloroethane			11			10			10			50			10
1,1-Dichloroethene			11			10	0.793	J	10			50			10
1,2-Dichloroethane			11			10			10			50			10
1,2-Dichloroethene (total)			11			10			10			50			10
1,2-Dichloropropane			11			10			10			50			10
2-Butanone			11		UJ	10		UJ	10		UJ	50		UJ	10
2-Hexanone			11		UJ	10		UJ	10		UJ	50		UJ	10
4-Methyl-2-Pentanone			11		UJ	10		UJ	10		UJ	50		UJ	10
Acetone			11		UJ	10		UJ	10	29.1	J	50		UJ	10
Benzene			11			10			10			50			10
Bromoform			11			10			10			50			10
Carbon Disulfide			11			10			10			50			10
Carbon Tetrachloride			11			10			10		UJ	50			10
Chlorobenzene			11			10			10			50	0.661	J	10
Chlorodibromomethane			11			10			10			50			10
Chloroethane		UJ	11		UJ	10		UJ	10		UJ	50		UJ	10
Chloroform			11			10			10			50			10
cis-1,3-Dichloropropylene			11			10			10			50			10
Dichlorobromomethane			11			10			10			50			10
Ethylbenzene			11			10	2.45	J	10			50			10
Methyl Bromide		UJ	11		UJ	10		UJ	10		UJ	50		UJ	10
Methyl Chloride			11		UJ	10		UJ	10		UJ	50		UJ	10
Methylene Chloride	7.44	UJ	11	16.8	UJ	10	6.39	UJ	10	44	UJ	50	13.5	UJ	10
Styrene			11			10			10			50			10
Tetrachloroethylene			11			10			10			50			10
Toluene	1.86	J	11	19.5		10	651	J	10	132	J	50	8.57	J	10
trans-1,3-Dichloropropene			11			10			10			50			10
Trichloroethene			11			10	0.535	J	10			50	0.573	J	10
Vinyl Chloride			11			10			10			50			10
Xylenes (Total)			11	2.5	J	10	10.4		10	3.33	J	50	2.48	J	10

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC043			SSDTC044			SSDTC045			SSDTC046			SSDTC047		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			10			10			10			10			10
1,1,2,2-Tetrachloroethane			10			10			10			10			10
1,1,2-Trichloroethane			10			10			10			10			10
1,1-Dichloroethane			10			10			10			10			10
1,1-Dichloroethene			10			10			10			10			10
1,2-Dichloroethane			10			10			10			10			10
1,2-Dichloroethene (total)			10			10			10			10			10
1,2-Dichloropropane			10			10			10			10			10
2-Butanone			10		UJ	10		UJ	10		UJ	10			10
2-Hexanone			10		UJ	10		UJ	10		UJ	10			10
4-Methyl-2-Pentanone			10		UJ	10		UJ	10			10			10
Acetone			10			10			10			10			10
Benzene			10			10			10			10			10
Bromoform			10			10			10			10			10
Carbon Disulfide			10			10			10			10			10
Carbon Tetrachloride			10			10			10		UJ	10			10
Chlorobenzene			10			10			10			10			10
Chlorodibromomethane			10			10			10			10			10
Chloroethane		UJ	10		UJ	10		UJ	10		UJ	10		UJ	10
Chloroform			10			10			10			10			10
cis-1,3-Dichloropropylene			10			10			10			10			10
Dichlorobromomethane			10			10			10			10			10
Ethylbenzene			10			10			10			10			10
Methyl Bromide		UJ	10		UJ	10		UJ	10		UJ	10		UJ	10
Methyl Chloride		UJ	10		UJ	10		UJ	10			10		UJ	10
Methylene Chloride	8.91	UJ	10	9.84	UJ	10	11	UJ	10	10.5	UJ	10	7.72	UJ	10
Styrene			10			10			10			10			10
Tetrachloroethylene			10			10			10			10			10
Toluene	0.754	J	10	1.51	J	10	1.43	J	10	1.23	J	10	72.8		10
trans-1,3-Dichloropropene			10			10			10			10			10
Trichloroethene			10			10			10			10			10
Vinyl Chloride			10			10			10			10			10
Xylenes (Total)			10			10			10			10	1.6	J	10

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC048			SSDTC048DL1			SSDTC049			SSDTC049DL1			SSDTC050		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			10			20			10			20			10
1,1,2,2-Tetrachloroethane			10			20			10			20			10
1,1,2-Trichloroethane			10			20			10			20			10
1,1-Dichloroethane			10			20			10			20			10
1,1-Dichloroethene			10			20			10			20			10
1,2-Dichloroethane			10			20			10			20			10
1,2-Dichloroethene (total)			10			20			10			20			10
1,2-Dichloropropane			10			20			10			20			10
2-Butanone	436	J	10		UJ	20	548	J	10		UJ	20	207	J	10
2-Hexanone		UJ	10		UJ	20		UJ	10		UJ	20		UJ	10
4-Methyl-2-Pentanone			10	6.13	J	20			10	3.77	J	20			10
Acetone	12.9	UJ	10	33.4	UJ	20		UJ	10	47.5	UJ	20	10.4	UJ	10
Benzene			10			20			10			20			10
Bromoform			10			20			10			20			10
Carbon Disulfide			10			20			10			20			10
Carbon Tetrachloride		UJ	10		UJ	20		UJ	10		UJ	20		UJ	10
Chlorobenzene			10			20			10			20			10
Chlorodibromomethane			10			20			10			20			10
Chloroethane		UJ	10		UJ	20		UJ	10		UJ	20		UJ	10
Chloroform			10			20			10			20			10
cis-1,3-Dichloropropylene			10			20			10			20			10
Dichlorobromomethane			10			20			10			20			10
Ethylbenzene	2.87	J	10	2.11	J	20	2.86	J	10			20	1.96	J	10
Methyl Bromide		UJ	10		UJ	20		UJ	10		UJ	20		UJ	10
Methyl Chloride			10		UJ	20			10		UJ	20			10
Methylene Chloride	13.8	UJ	10	26.7	UJ	20	14.4	UJ	10	24	UJ	20	12.3	UJ	10
Styrene			10			20			10			20			10
Tetrachloroethylene			10			20			10			20			10
Toluene	854	J	10	196		20	859	J	10	106		20	691	J	10
trans-1,3-Dichloropropene			10			20			10			20			10
Trichloroethene			10			20			10			20			10
Vinyl Chloride			10			20			10			20			10
Xylenes (Total)	13.4		10	11.5	J	20	11.9		10	5.71	J	20	8.26	J	10

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC050DL1			SSDTC051			SSDTC051DL1			SSDTC052			SSDTC052DL1		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			20			10			20			10			20
1,1,2,2-Tetrachloroethane			20			10			20			10			20
1,1,2-Trichloroethane			20			10			20			10			20
1,1-Dichloroethane			20			10			20			10			20
1,1-Dichloroethene			20			10			20			10			20
1,2-Dichloroethane			20			10			20			10			20
1,2-Dichloroethene (total)			20			10			20			10			20
1,2-Dichloropropane			20			10			20			10			20
2-Butanone		UJ	20	48.7	J	10		UJ	20	353	J	10	80.8	J	20
2-Hexanone		UJ	20		UJ	10		UJ	20		UJ	10		UJ	20
4-Methyl-2-Pentanone			20			10			20			10			20
Acetone	24.6		20			10	33.4		20	10.4	UJ	10		UJ	20
Benzene			20			10			20			10			20
Bromoform			20			10			20			10			20
Carbon Disulfide			20			10			20			10			20
Carbon Tetrachloride		UJ	20		UJ	10		UJ	20		UJ	10		UJ	20
Chlorobenzene			20			10			20			10			20
Chlorodibromomethane			20			10			20			10			20
Chloroethane		UJ	20		UJ	10		UJ	20		UJ	10		UJ	20
Chloroform			20			10			20			10			20
cis-1,3-Dichloropropylene			20			10			20			10			20
Dichlorobromomethane			20			10			20			10			20
Ethylbenzene			20			10			20	2.46	J	10			20
Methyl Bromide		UJ	20		UJ	10		UJ	20		UJ	10		UJ	20
Methyl Chloride		UJ	20			10		UJ	20			10		UJ	20
Methylene Chloride	25.9	UJ	20	11.7	UJ	10	24.6	UJ	20	13.6	UJ	10	24.7	UJ	20
Styrene			20			10			20			10			20
Tetrachloroethylene			20			10			20			10			20
Toluene	283		20	260	J	10	101		20	707	J	10	106		20
trans-1,3-Dichloropropene			20			10			20			10			20
Trichloroethene			20			10			20			10			20
Vinyl Chloride			20			10			20			10			20
Xylenes (Total)	4.67	J	20	2.28	J	10	1.77	J	20	10.3		10	3.23	J	20

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC053			SSDTC053DL1			SSDTC054			SSDTC055			SSDTC056		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			10			20			20			20			20
1,1,2,2-Tetrachloroethane			10			20			20			20			20
1,1,2-Trichloroethane			10			20			20			20			20
1,1-Dichloroethane			10			20			20			20			20
1,1-Dichloroethene			10			20			20			20			20
1,2-Dichloroethane			10			20			20			20			20
1,2-Dichloroethene (total)			10			20			20			20			20
1,2-Dichloropropane			10			20			20			20			20
2-Butanone	316	J	10			20	357		20			20			20
2-Hexanone		UJ	10			20			20			20			20
4-Methyl-2-Pentanone			10			20			20			20			20
Acetone	9.52	UJ	10	18.2	UJ	20	21.9	UJ	20	15.1	UJ	20	18.5	UJ	20
Benzene			10			20			20			20			20
Bromoform			10			20			20			20			20
Carbon Disulfide			10			20			20			20			20
Carbon Tetrachloride		UJ	10			20			20			20			20
Chlorobenzene			10			20			20			20			20
Chlorodibromomethane			10			20			20			20			20
Chloroethane		UJ	10		UJ	20		UJ	20		UJ	20		UJ	20
Chloroform			10			20			20			20			20
cis-1,3-Dichloropropylene			10			20			20			20			20
Dichlorobromomethane			10			20			20			20			20
Ethylbenzene	1.85	J	10			20	1.23	J	20			20	1.14	J	20
Methyl Bromide		UJ	10		UJ	20		UJ	20		UJ	20		UJ	20
Methyl Chloride			10		UJ	20		UJ	20		UJ	20		UJ	20
Methylene Chloride	13.2	UJ	10	22.9	UJ	20	26.1	UJ	20	25.7	UJ	20	29.3	UJ	20
Styrene			10			20			20			20			20
Tetrachloroethylene			10			20			20			20			20
Toluene	491	J	10	58.8		20	370		20	347		20	438		20
trans-1,3-Dichloropropene			10			20			20			20			20
Trichloroethene			10			20			20			20			20
Vinyl Chloride			10			20			20			20			20
Xylenes (Total)	8.65	J	10			20	7.17	J	20	5.54	J	20	5.21	J	20

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC057			SSDTC058			SSDTC059			SSDTC060			SSDTC061		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			20			10			10			10			10
1,1,2,2-Tetrachloroethane			20		UJ	10		UJ	10		UJ	10		UJ	10
1,1,2-Trichloroethane			20			10			10			10			10
1,1-Dichloroethane			20			10			10			10			10
1,1-Dichloroethene			20			10			10			10			10
1,2-Dichloroethane			20			10			10			10			10
1,2-Dichloroethene (total)			20			10			10			10			10
1,2-Dichloropropane			20			10			10			10			10
2-Butanone			20			10			10			10			10
2-Hexanone			20			10			10			10			10
4-Methyl-2-Pentanone			20			10			10			10			10
Acetone			20	6.98	UJ	10	7.48	UJ	10	8.29	UJ	10	8.44	UJ	10
Benzene			20			10			10			10			10
Bromoform			20		UJ	10		UJ	10		UJ	10		UJ	10
Carbon Disulfide			20			10			10			10			10
Carbon Tetrachloride			20			10			10			10			10
Chlorobenzene			20			10			10			10			10
Chlorodibromomethane			20			10			10			10			10
Chloroethane		UJ	20		UJ	10		UJ	10		UJ	10		UJ	10
Chloroform			20			10			10			10			10
cis-1,3-Dichloropropylene			20			10			10			10			10
Dichlorobromomethane			20			10			10			10			10
Ethylbenzene			20			10			10	1.27	J	10	0.686	J	10
Methyl Bromide		UJ	20		UJ	10		UJ	10		UJ	10		UJ	10
Methyl Chloride		UJ	20			10			10			10			10
Methylene Chloride	26.5	UJ	20	14.8	UJ	10	17.7	UJ	10	15.2	UJ	10	13.3	UJ	10
Styrene			20			10			10			10			10
Tetrachloroethylene			20			10			10			10			10
Toluene	204		20	1.26	J	10	40.6		10	209		10	133		10
trans-1,3-Dichloropropene			20			10			10			10			10
Trichloroethene			20			10			10			10			10
Vinyl Chloride			20			10			10			10			10
Xylenes (Total)	2.57	J	20	0.836	J	10	3.73	J	10	6.02	J	10	3.13	J	10

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC062			SSDTC062DL1			SSDTC063			SSDTC064			SSDTC064R		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			10			20			10		UJ	10			11.8
1,1,2,2-Tetrachloroethane		UJ	10		UJ	20		UJ	10		UJ	10			11.8
1,1,2-Trichloroethane			10			20			10		UJ	10			11.8
1,1-Dichloroethane			10			20			10		UJ	10			11.8
1,1-Dichloroethene			10			20			10		UJ	10			11.8
1,2-Dichloroethane			10			20			10		UJ	10			11.8
1,2-Dichloroethene (total)			10			20			10		UJ	10			11.8
1,2-Dichloropropane			10			20			10		UJ	10			11.8
2-Butanone			10			20			10		UJ	10			11.8
2-Hexanone			10			20			10		UJ	10			11.8
4-Methyl-2-Pentanone			10			20			10		UJ	10			11.8
Acetone	6.73	UJ	10	12.2	UJ	20	6.06	UJ	10		UJ	10			11.8
Benzene			10			20			10		UJ	10			11.8
Bromoform		UJ	10		UJ	20		UJ	10		UJ	10			11.8
Carbon Disulfide			10			20			10		UJ	10			11.8
Carbon Tetrachloride			10			20			10		UJ	10			11.8
Chlorobenzene			10			20			10		UJ	10			11.8
Chlorodibromomethane			10			20			10		UJ	10			11.8
Chloroethane		UJ	10		UJ	20		UJ	10		UJ	10			11.8
Chloroform			10			20			10	0.632	UJ	10			11.8
cis-1,3-Dichloropropylene			10			20			10		UJ	10			11.8
Dichlorobromomethane			10			20			10		UJ	10			11.8
Ethylbenzene	1.03	J	10	0.434	J	20			10		UJ	10			11.8
Methyl Bromide		UJ	10		UJ	20		UJ	10		UJ	10			11.8
Methyl Chloride			10			20			10		UJ	10			11.8
Methylene Chloride	12.7	UJ	10	22.1	UJ	20	13	UJ	10	12.3	UJ	10	8.76	UJ	11.8
Styrene			10			20			10		UJ	10			11.8
Tetrachloroethylene			10			20			10		UJ	10			11.8
Toluene	297	J	10	126		20	4.36	J	10	0.475	J	10			11.8
trans-1,3-Dichloropropene			10			20			10		UJ	10			11.8
Trichloroethene			10			20			10		UJ	10			11.8
Vinyl Chloride			10			20			10		UJ	10			11.8
Xylenes (Total)	5.56	J	10	2.72	J	20			10	0.844	UJ	10	0.83	UJ	11.8

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC065			SSDTC065R			SSDTC066			SSDTC066R			SSDTC067		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane		UJ	10			12		UJ	10			11.8		UJ	10
1,1,2,2-Tetrachloroethane		UJ	10			12		UJ	10			11.8		UJ	10
1,1,2-Trichloroethane		UJ	10			12		UJ	10			11.8		UJ	10
1,1-Dichloroethane		UJ	10			12		UJ	10			11.8		UJ	10
1,1-Dichloroethene		UJ	10			12		UJ	10			11.8		UJ	10
1,2-Dichloroethane		UJ	10			12		UJ	10			11.8		UJ	10
1,2-Dichloroethene (total)		UJ	10			12		UJ	10			11.8		UJ	10
1,2-Dichloropropane		UJ	10			12		UJ	10			11.8		UJ	10
2-Butanone		UJ	10			12		UJ	10			11.8	86.5	J	10
2-Hexanone		UJ	10			12		UJ	10			11.8		UJ	10
4-Methyl-2-Pentanone		UJ	10			12		UJ	10			11.8		UJ	10
Acetone		UJ	10			12		UJ	10			11.8		UJ	10
Benzene		UJ	10			12		UJ	10			11.8		UJ	10
Bromoform		UJ	10			12		UJ	10			11.8		UJ	10
Carbon Disulfide		UJ	10			12		UJ	10			11.8		UJ	10
Carbon Tetrachloride		UJ	10			12		UJ	10			11.8		UJ	10
Chlorobenzene		UJ	10			12		UJ	10			11.8		UJ	10
Chlorodibromomethane		UJ	10			12		UJ	10			11.8		UJ	10
Chloroethane		UJ	10			12		UJ	10			11.8		UJ	10
Chloroform	0.763	UJ	10			12	0.655	UJ	10			11.8		UJ	10
cis-1,3-Dichloropropylene		UJ	10			12		UJ	10			11.8		UJ	10
Dichlorobromomethane		UJ	10			12		UJ	10			11.8		UJ	10
Ethylbenzene		UJ	10			12	0.184	J	10			11.8	0.698	J	10
Methyl Bromide		UJ	10			12		UJ	10			11.8		UJ	10
Methyl Chloride		UJ	10			12		UJ	10			11.8		UJ	10
Methylene Chloride	12.2	UJ	10	7.57	UJ	12	12.6	UJ	10	8.15	UJ	11.8	10.4	UJ	10
Styrene		UJ	10			12		UJ	10			11.8		UJ	10
Tetrachloroethylene		UJ	10			12		UJ	10			11.8		UJ	10
Toluene	0.297	J	10			12	0.956	J	10			11.8	97.6	J	10
trans-1,3-Dichloropropene		UJ	10			12		UJ	10			11.8		UJ	10
Trichloroethene		UJ	10			12		UJ	10			11.8		UJ	10
Vinyl Chloride		UJ	10			12		UJ	10			11.8		UJ	10
Xylenes (Total)	0.858	UJ	10	0.874	UJ	12	2.59	UJ	10	0.902	UJ	11.8	3.45	J	10

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC067R			SSDTC068			SSDTC068R			SSDTC069			SSDTC069R		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			11.9		UJ	10			11.8		UJ	10			11.8
1,1,2,2-Tetrachloroethane			11.9		UJ	10			11.8		UJ	10			11.8
1,1,2-Trichloroethane			11.9		UJ	10			11.8		UJ	10			11.8
1,1-Dichloroethane			11.9		UJ	10			11.8		UJ	10			11.8
1,1-Dichloroethene			11.9		UJ	10			11.8		UJ	10			11.8
1,2-Dichloroethane			11.9		UJ	10			11.8		UJ	10			11.8
1,2-Dichloroethene (total)			11.9		UJ	10			11.8		UJ	10			11.8
1,2-Dichloropropane			11.9		UJ	10			11.8		UJ	10			11.8
2-Butanone			11.9		UJ	10			11.8		UJ	10			11.8
2-Hexanone			11.9		UJ	10			11.8		UJ	10			11.8
4-Methyl-2-Pentanone			11.9		UJ	10			11.8		UJ	10			11.8
Acetone			11.9		UJ	10			11.8		UJ	10			11.8
Benzene			11.9		UJ	10			11.8		UJ	10			11.8
Bromoform			11.9		UJ	10			11.8		UJ	10			11.8
Carbon Disulfide			11.9		UJ	10			11.8		UJ	10			11.8
Carbon Tetrachloride			11.9		UJ	10			11.8		UJ	10			11.8
Chlorobenzene			11.9		UJ	10			11.8		UJ	10			11.8
Chlorodibromomethane			11.9		UJ	10			11.8		UJ	10			11.8
Chloroethane			11.9		UJ	10			11.8		UJ	10			11.8
Chloroform			11.9	0.728	UJ	10			11.8	0.654	UJ	10			11.8
cis-1,3-Dichloropropylene			11.9		UJ	10			11.8		UJ	10			11.8
Dichlorobromomethane			11.9		UJ	10			11.8		UJ	10			11.8
Ethylbenzene			11.9		UJ	10			11.8		UJ	10			11.8
Methyl Bromide			11.9		UJ	10			11.8		UJ	10			11.8
Methyl Chloride			11.9		UJ	10			11.8		UJ	10			11.8
Methylene Chloride	7.74	UJ	11.9	14.4	UJ	10	8.07	UJ	11.8	15.4	UJ	10	7.49	UJ	11.8
Styrene			11.9		UJ	10			11.8		UJ	10			11.8
Tetrachloroethylene			11.9		UJ	10			11.8		UJ	10			11.8
Toluene			11.9	0.84	J	10			11.8	0.706	J	10			11.8
trans-1,3-Dichloropropene			11.9		UJ	10			11.8		UJ	10			11.8
Trichloroethene			11.9		UJ	10			11.8		UJ	10			11.8
Vinyl Chloride			11.9		UJ	10			11.8		UJ	10			11.8
Xylenes (Total)	0.724	UJ	11.9	0.9	UJ	10	0.832	UJ	11.8	0.375	UJ	10	0.432	UJ	11.8

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC070			SSDTC070R			SSDTC071			SSDTC071R			SSDTC072		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane		UJ	10			11.9		UJ	10			11.9		UJ	10
1,1,2,2-Tetrachloroethane		UJ	10			11.9		UJ	10			11.9		UJ	10
1,1,2-Trichloroethane		UJ	10			11.9		UJ	10			11.9		UJ	10
1,1-Dichloroethane		UJ	10			11.9		UJ	10			11.9		UJ	10
1,1-Dichloroethene		UJ	10			11.9		UJ	10			11.9		UJ	10
1,2-Dichloroethane		UJ	10			11.9		UJ	10			11.9		UJ	10
1,2-Dichloroethene (total)		UJ	10			11.9		UJ	10			11.9		UJ	10
1,2-Dichloropropane		UJ	10			11.9		UJ	10			11.9		UJ	10
2-Butanone		UJ	10			11.9		UJ	10			11.9		UJ	10
2-Hexanone		UJ	10			11.9		UJ	10			11.9		UJ	10
4-Methyl-2-Pentanone		UJ	10			11.9		UJ	10			11.9		UJ	10
Acetone		UJ	10			11.9		UJ	10			11.9		UJ	10
Benzene		UJ	10			11.9		UJ	10			11.9		UJ	10
Bromoform		UJ	10			11.9		UJ	10			11.9		UJ	10
Carbon Disulfide		UJ	10			11.9		UJ	10			11.9		UJ	10
Carbon Tetrachloride		UJ	10			11.9		UJ	10			11.9		UJ	10
Chlorobenzene		UJ	10			11.9		UJ	10			11.9		UJ	10
Chlorodibromomethane		UJ	10			11.9		UJ	10			11.9		UJ	10
Chloroethane		UJ	10			11.9		UJ	10			11.9		UJ	10
Chloroform	0.914	UJ	10			11.9	0.616	UJ	10			11.9	0.576	UJ	10
cis-1,3-Dichloropropylene		UJ	10			11.9		UJ	10			11.9		UJ	10
Dichlorobromomethane		UJ	10			11.9		UJ	10			11.9		UJ	10
Ethylbenzene		UJ	10			11.9		UJ	10			11.9		UJ	10
Methyl Bromide		UJ	10			11.9		UJ	10			11.9		UJ	10
Methyl Chloride		UJ	10			11.9		UJ	10			11.9		UJ	10
Methylene Chloride	17	UJ	10	8.54	UJ	11.9	17	UJ	10	8.24	UJ	11.9	16.2	UJ	10
Styrene		UJ	10			11.9		UJ	10			11.9		UJ	10
Tetrachloroethylene		UJ	10			11.9		UJ	10			11.9		UJ	10
Toluene	0.145	J	10			11.9	0.634	UJ	10			11.9	0.395	J	10
trans-1,3-Dichloropropene		UJ	10			11.9		UJ	10			11.9		UJ	10
Trichloroethene		UJ	10			11.9		UJ	10			11.9		UJ	10
Vinyl Chloride		UJ	10			11.9		UJ	10			11.9		UJ	10
Xylenes (Total)	1.43	UJ	10	0.634	UJ	11.9	2.43	UJ	10	0.848	UJ	11.9	1.04	UJ	10

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC072R			SSDTC073			SSDTC073R			SSDTC074			SSDTC074R		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			11.1		UJ	10			12		UJ	10			11.4
1,1,2,2-Tetrachloroethane			11.1		UJ	10			12		UJ	10			11.4
1,1,2-Trichloroethane			11.1		UJ	10			12		UJ	10			11.4
1,1-Dichloroethane			11.1		UJ	10			12		UJ	10			11.4
1,1-Dichloroethene			11.1		UJ	10			12		UJ	10			11.4
1,2-Dichloroethane			11.1		UJ	10			12		UJ	10			11.4
1,2-Dichloroethene (total)			11.1		UJ	10			12		UJ	10			11.4
1,2-Dichloropropane			11.1		UJ	10			12		UJ	10			11.4
2-Butanone			11.1		UJ	10			12		UJ	10			11.4
2-Hexanone			11.1		UJ	10			12		UJ	10			11.4
4-Methyl-2-Pentanone			11.1		UJ	10			12		UJ	10			11.4
Acetone			11.1		UJ	10			12		UJ	10			11.4
Benzene			11.1		UJ	10			12		UJ	10	0.124	UJ	11.4
Bromoform			11.1		UJ	10			12		UJ	10			11.4
Carbon Disulfide			11.1		UJ	10			12		UJ	10			11.4
Carbon Tetrachloride			11.1		UJ	10			12		UJ	10			11.4
Chlorobenzene			11.1		UJ	10			12		UJ	10			11.4
Chlorodibromomethane			11.1		UJ	10			12		UJ	10			11.4
Chloroethane			11.1		UJ	10			12		UJ	10			11.4
Chloroform			11.1	0.625	UJ	10			12		UJ	10			11.4
cis-1,3-Dichloropropylene			11.1		UJ	10			12		UJ	10			11.4
Dichlorobromomethane			11.1		UJ	10			12		UJ	10			11.4
Ethylbenzene			11.1		UJ	10			12	0.316	J	10			11.4
Methyl Bromide			11.1		UJ	10			12		UJ	10			11.4
Methyl Chloride			11.1		UJ	10			12		UJ	10			11.4
Methylene Chloride	5.82	UJ	11.1	13.6	UJ	10	7.6	UJ	12	8.38	UJ	10	14.3	UJ	11.4
Styrene			11.1		UJ	10			12		UJ	10			11.4
Tetrachloroethylene			11.1		UJ	10			12		UJ	10			11.4
Toluene			11.1	0.828	J	10			12	69.7	J	10	4.02	J	11.4
trans-1,3-Dichloropropene			11.1		UJ	10			12		UJ	10			11.4
Trichloroethene			11.1		UJ	10			12		UJ	10			11.4
Vinyl Chloride			11.1		UJ	10			12		UJ	10			11.4
Xylenes (Total)	0.668	UJ	11.1	2.97	UJ	10	0.598	UJ	12	2.64	J	10	1.09	UJ	11.4

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC075			SSDTC075R			SSDTC076		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane		UJ	10			12		UJ	10
1,1,2,2-Tetrachloroethane		UJ	10			12		UJ	10
1,1,2-Trichloroethane		UJ	10			12		UJ	10
1,1-Dichloroethane		UJ	10			12		UJ	10
1,1-Dichloroethene		UJ	10			12		UJ	10
1,2-Dichloroethane		UJ	10			12		UJ	10
1,2-Dichloroethene (total)		UJ	10			12		UJ	10
1,2-Dichloropropane		UJ	10			12		UJ	10
2-Butanone		UJ	10			12		UJ	10
2-Hexanone		UJ	10			12		UJ	10
4-Methyl-2-Pentanone		UJ	10			12		UJ	10
Acetone		UJ	10			12		UJ	10
Benzene		UJ	10			12		UJ	10
Bromoform		UJ	10			12		UJ	10
Carbon Disulfide		UJ	10			12		UJ	10
Carbon Tetrachloride		UJ	10			12		UJ	10
Chlorobenzene		UJ	10			12		UJ	10
Chlorodibromomethane		UJ	10			12		JU	10
Chloroethane		UJ	10			12		UJ	10
Chloroform		UJ	10			12	0.151	J	10
cis-1,3-Dichloropropylene		UJ	10			12		UJ	10
Dichlorobromomethane		UJ	10			12		UJ	10
Ethylbenzene	0.758	J	10			12	0.834	J	10
Methyl Bromide		UJ	10			12		UJ	10
Methyl Chloride		UJ	10			12		UJ	10
Methylene Chloride	8.69	UJ	10	14.2	UJ	12	15	UJ	10
Styrene		UJ	10			12	0.316	UJ	10
Tetrachloroethylene		UJ	10			12		UJ	10
Toluene	118	J	10			12	4.89	UJ	10
trans-1,3-Dichloropropene		UJ	10			12		UJ	10
Trichloroethene		UJ	10			12	0.19	J	10
Vinyl Chloride		UJ	10			12		UJ	10
Xylenes (Total)	5.38	J	10	16.4	J	12	8.62	UJ	10

	SSDTC076R			SSDTC077		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			11.9		UJ	11.8
1,1,2,2-Tetrachloroethane			11.9		UJ	11.8
1,1,2-Trichloroethane			11.9		UJ	11.8
1,1-Dichloroethane			11.9		UJ	11.8
1,1-Dichloroethene			11.9		UJ	11.8
1,2-Dichloroethane			11.9		UJ	11.8
1,2-Dichloroethene (total)			11.9		UJ	11.8
1,2-Dichloropropane			11.9		UJ	11.8
2-Butanone			11.9		UJ	11.8
2-Hexanone			11.9		UJ	11.8
4-Methyl-2-Pentanone			11.9		UJ	11.8
Acetone			11.9		UJ	11.8
Benzene			11.9		UJ	11.8
Bromoform			11.9		UJ	11.8
Carbon Disulfide			11.9		UJ	11.8
Carbon Tetrachloride			11.9		UJ	11.8
Chlorobenzene			11.9		UJ	11.8
Chlorodibromomethane			11.9		UJ	11.8
Chloroethane			11.9		UJ	11.8
Chloroform			11.9	0.593	UJ	11.8
cis-1,3-Dichloropropylene			11.9		UJ	11.8
Dichlorobromomethane			11.9		UJ	11.8
Ethylbenzene			11.9		UJ	11.8
Methyl Bromide			11.9		UJ	11.8
Methyl Chloride			11.9		UJ	11.8
Methylene Chloride	15	UJ	11.9	16.7	UJ	11.8
Styrene			11.9		UJ	11.8
Tetrachloroethylene			11.9		UJ	11.8
Toluene			11.9	0.577	UJ	11.8
trans-1,3-Dichloropropene			11.9		UJ	11.8
Trichloroethene			11.9		UJ	11.8
Vinyl Chloride			11.9		UJ	11.8
Xylenes (Total)	1.16	UJ	11.9	1.33	J	11.8

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC077R			SSDTC078			SSDTC078R			SSDTC079			SSDTC079R		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			11.9		UJ	11.9			12.2		UJ	11.8			11.8
1,1,2,2-Tetrachloroethane			11.9		UJ	11.9			12.2		UJ	11.8			11.8
1,1,2-Trichloroethane			11.9		UJ	11.9			12.2		UJ	11.8			11.8
1,1-Dichloroethane			11.9		UJ	11.9			12.2		UJ	11.8			11.8
1,1-Dichloroethene			11.9		UJ	11.9			12.2		UJ	11.8			11.8
1,2-Dichloroethane			11.9		UJ	11.9			12.2		UJ	11.8			11.8
1,2-Dichloroethene (total)			11.9		UJ	11.9			12.2		UJ	11.8			11.8
1,2-Dichloropropane			11.9		UJ	11.9			12.2		UJ	11.8			11.8
2-Butanone			11.9		UJ	11.9			12.2		UJ	11.8			11.8
2-Hexanone			11.9		UJ	11.9			12.2		UJ	11.8			11.8
4-Methyl-2-Pentanone			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Acetone			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Benzene			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Bromoform			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Carbon Disulfide			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Carbon Tetrachloride			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Chlorobenzene			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Chlorodibromomethane			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Chloroethane			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Chloroform			11.9	0.718	UJ	11.9			12.2	0.946	UJ	11.8			11.8
cis-1,3-Dichloropropylene			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Dichlorobromomethane			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Ethylbenzene			11.9		UJ	11.9	0.114	UJ	12.2	0.276	J	11.8			11.8
Methyl Bromide			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Methyl Chloride			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Methylene Chloride	15.7	UJ	11.9	15.9	UJ	11.9	12.6	UJ	12.2	17.8	UJ	11.8	13.4	UJ	11.8
Styrene			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Tetrachloroethylene			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Toluene			11.9	0.805	UJ	11.9	22.2		12.2	2.72	UJ	11.8	18.7		11.8
trans-1,3-Dichloropropene			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Trichloroethene			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Vinyl Chloride			11.9		UJ	11.9			12.2		UJ	11.8			11.8
Xylenes (Total)	1.61	UJ	11.9	1.66	J	11.9	1.36	UJ	12.2	4.68	UJ	11.8	1.23	UJ	11.8

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC080			SSDTC080R			SSDTC081			SSDTC081R			SSDTC082		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane		UJ	12			12.2		UJ	11.8			12.2		UJ	12
1,1,2,2-Tetrachloroethane		UJ	12			12.2		UJ	11.8			12.2		UJ	12
1,1,2-Trichloroethane		UJ	12			12.2		UJ	11.8			12.2		UJ	12
1,1-Dichloroethane		UJ	12			12.2		UJ	11.8			12.2		UJ	12
1,1-Dichloroethene		UJ	12			12.2		UJ	11.8			12.2		UJ	12
1,2-Dichloroethane		UJ	12			12.2		UJ	11.8			12.2		UJ	12
1,2-Dichloroethene (total)		UJ	12			12.2		UJ	11.8			12.2		UJ	12
1,2-Dichloropropane		UJ	12			12.2		UJ	11.8			12.2		UJ	12
2-Butanone		UJ	12			12.2		UJ	11.8	101		12.2		UJ	12
2-Hexanone		UJ	12			12.2		UJ	11.8			12.2		UJ	12
4-Methyl-2-Pentanone		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Acetone		UJ	12			12.2		UJ	11.8	14.9		12.2		UJ	12
Benzene		UJ	12			12.2		UJ	11.8	0.101	UJ	12.2		UJ	12
Bromoform		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Carbon Disulfide		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Carbon Tetrachloride		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Chlorobenzene		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Chlorodibromomethane		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Chloroethane		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Chloroform	0.663	UJ	12			12.2	0.753	UJ	11.8			12.2	0.712	UJ	12
cis-1,3-Dichloropropylene		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Dichlorobromomethane		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Ethylbenzene		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Methyl Bromide		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Methyl Chloride		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Methylene Chloride	18.9	UJ	12	14.5	UJ	12.2	14.4	UJ	11.8	13.7	UJ	12.2	14.9	UJ	12
Styrene		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Tetrachloroethylene		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Toluene	0.932	UJ	12			12.2	1.11	UJ	11.8	4.53	J	12.2	0.958	UJ	12
trans-1,3-Dichloropropene		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Trichloroethene		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Vinyl Chloride		UJ	12			12.2		UJ	11.8			12.2		UJ	12
Xylenes (Total)	1.27	J	12	0.865	UJ	12.2	2.09	J	11.8	1.33	UJ	12.2	1.6	J	12

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC082R			SSDTC083			SSDTC083R			SSDTC084			SSDTC084R		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			12.3		UJ	11.5			12		UJ	11.8			12.2
1,1,2,2-Tetrachloroethane			12.3		UJ	11.5			12		UJ	11.8			12.2
1,1,2-Trichloroethane			12.3		UJ	11.5			12		UJ	11.8			12.2
1,1-Dichloroethane			12.3		UJ	11.5			12		UJ	11.8			12.2
1,1-Dichloroethene			12.3		UJ	11.5			12		UJ	11.8			12.2
1,2-Dichloroethane			12.3		UJ	11.5			12		UJ	11.8			12.2
1,2-Dichloroethene (total)			12.3		UJ	11.5			12		UJ	11.8			12.2
1,2-Dichloropropane			12.3		UJ	11.5			12		UJ	11.8			12.2
2-Butanone			12.3		UJ	11.5			12		UJ	11.8			12.2
2-Hexanone			12.3		UJ	11.5			12		UJ	11.8			12.2
4-Methyl-2-Pentanone			12.3		UJ	11.5			12		UJ	11.8			12.2
Acetone			12.3		UJ	11.5			12		UJ	11.8			12.2
Benzene			12.3		UJ	11.5			12		UJ	11.8			12.2
Bromoform			12.3		UJ	11.5			12		UJ	11.8			12.2
Carbon Disulfide			12.3		UJ	11.5			12		UJ	11.8			12.2
Carbon Tetrachloride			12.3		UJ	11.5			12		UJ	11.8			12.2
Chlorobenzene			12.3		UJ	11.5			12		UJ	11.8			12.2
Chlorodibromomethane			12.3		UJ	11.5			12		UJ	11.8			12.2
Chloroethane			12.3		UJ	11.5			12		UJ	11.8			12.2
Chloroform			12.3	0.947	UJ	11.5			12	0.934	UJ	11.8			12.2
cis-1,3-Dichloropropylene			12.3		UJ	11.5			12		UJ	11.8			12.2
Dichlorobromomethane			12.3		UJ	11.5			12		UJ	11.8			12.2
Ethylbenzene			12.3	0.207	J	11.5			12		UJ	11.8			12.2
Methyl Bromide			12.3		UJ	11.5			12		UJ	11.8			12.2
Methyl Chloride			12.3		UJ	11.5			12		UJ	11.8			12.2
Methylene Chloride	13.6	UJ	12.3	25.5	UJ	11.5	15.9	UJ	12	21.3	UJ	11.8	6.46	UJ	12.2
Styrene			12.3		UJ	11.5			12		UJ	11.8			12.2
Tetrachloroethylene			12.3		UJ	11.5			12		UJ	11.8			12.2
Toluene	1.76	J	12.3	1.84	UJ	11.5			12	0.918	UJ	11.8			12.2
trans-1,3-Dichloropropene			12.3		UJ	11.5			12		UJ	11.8			12.2
Trichloroethene			12.3		UJ	11.5			12		UJ	11.8			12.2
Vinyl Chloride			12.3		UJ	11.5			12		UJ	11.8			12.2
Xylenes (Total)	0.714	UJ	12.3	3.98	J	11.5	0.845	UJ	12	1.57	J	11.8	1.02	UJ	12.2

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC085			SSDTC085R			SSDTC086			SSDTC086R			SSDTC087		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
1,1,2,2-Tetrachloroethane		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
1,1,2-Trichloroethane		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
1,1-Dichloroethane		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
1,1-Dichloroethene		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
1,2-Dichloroethane		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
1,2-Dichloroethene (total)		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
1,2-Dichloropropane		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
2-Butanone		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
2-Hexanone		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
4-Methyl-2-Pentanone		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Acetone		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Benzene		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Bromoform		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Carbon Disulfide		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Carbon Tetrachloride		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Chlorobenzene		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Chlorodibromomethane		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Chloroethane		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Chloroform	0.578	UJ	11.6			11.9	0.653	UJ	11.8			12.2	0.861	UJ	11.6
cis-1,3-Dichloropropylene		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Dichlorobromomethane		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Ethylbenzene		UJ	11.6			11.9	1.83	J	11.8			12.2	1.61	J	11.6
Methyl Bromide		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Methyl Chloride		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Methylene Chloride	18.4	UJ	11.6	6.6	UJ	11.9	20.3	UJ	11.8	3.54	UJ	12.2	18.9	UJ	11.6
Styrene		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Tetrachloroethylene		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Toluene	1.01	UJ	11.6			11.9	196	J	11.8			12.2	170	J	11.6
trans-1,3-Dichloropropene		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Trichloroethene		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Vinyl Chloride		UJ	11.6			11.9		UJ	11.8			12.2		UJ	11.6
Xylenes (Total)	1.68	J	11.6	1.39	UJ	11.9	13.1	J	11.8	0.614	UJ	12.2	10	J	11.6

Table C-4
LEHR Environmental Restoration
VOC Analytical Results for Sample IDs SSDT020 - SSDTC090

	SSDTC087R			SSDTC088			SSDTC089			SSDTC090		
LAB_CHEM	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT	CONC	ER_Q	DET_LIMIT
1,1,1-Trichloroethane			12.2		UJ	10		UJ	10			11.4
1,1,2,2-Tetrachloroethane			12.2		UJ	10		UJ	10			11.4
1,1,2-Trichloroethane			12.2		UJ	10		UJ	10			11.4
1,1-Dichloroethane			12.2		UJ	10		UJ	10			11.4
1,1-Dichloroethene			12.2		UJ	10		UJ	10			11.4
1,2-Dichloroethane			12.2		UJ	10		UJ	10			11.4
1,2-Dichloroethene (total)			12.2		UJ	10		UJ	10			11.4
1,2-Dichloropropane			12.2		UJ	10		UJ	10			11.4
2-Butanone			12.2		UJ	10		UJ	10			11.4
2-Hexanone			12.2		UJ	10		UJ	10			11.4
4-Methyl-2-Pentanone			12.2		UJ	10		UJ	10			11.4
Acetone			12.2		UJ	10		UJ	10	26.2	UJ	11.4
Benzene			12.2		UJ	10		UJ	10			11.4
Bromoform			12.2		UJ	10		UJ	10			11.4
Carbon Disulfide			12.2		UJ	10		UJ	10			11.4
Carbon Tetrachloride			12.2		UJ	10		UJ	10			11.4
Chlorobenzene			12.2		UJ	10		UJ	10			11.4
Chlorodibromomethane			12.2		UJ	10		UJ	10			11.4
Chloroethane			12.2		UJ	10		UJ	10			11.4
Chloroform			12.2	0.61	UJ	10	0.607	UJ	10	0.806	UJ	11.4
cis-1,3-Dichloropropylene			12.2		UJ	10		UJ	10			11.4
Dichlorobromomethane			12.2		UJ	10		UJ	10	0.234	J	11.4
Ethylbenzene			12.2		UJ	10		UJ	10	0.713	J	11.4
Methyl Bromide			12.2		UJ	10		UJ	10			11.4
Methyl Chloride			12.2		UJ	10		UJ	10			11.4
Methylene Chloride	3.62	UJ	12.2	20.2	UJ	10	19.6	UJ	10	14.9	UJ	11.4
Styrene			12.2		UJ	10		UJ	10	1.03	J	11.4
Tetrachloroethylene			12.2		UJ	10		UJ	10			11.4
Toluene			12.2	0.962	UJ	10	0.744	UJ	10	3.31	J	11.4
trans-1,3-Dichloropropene			12.2		UJ	10		UJ	10			11.4
Trichloroethene			12.2		UJ	10		UJ	10			11.4
Vinyl Chloride			12.2		UJ	10		UJ	10			11.4
Xylenes (Total)	0.975	UJ	12.2	1.35	UJ	10	1.41	UJ	10	5.73	UJ	11.4

APPENDIX D

MERCURY RISK-BASED ACTION STANDARDS

APPENDIX D. MERCURY RISK-BASED ACTION STANDARDS CALCULATIONS

Project	Laboratory for Energy-Related Health Research, University of California at Davis, California
Prepared for:	U.S. Department of Energy, Oakland Operations Office, 1301 Clay Street, Oakland, California 95612
Prepared by:	Weiss Associates, 5801 Christie Avenue, Suite 600, Emeryville, CA 94608
Account Number:	128-4006-226 LEHR
Task:	Update to the RBAS determination for Mercury and Compounds using chemical specific values, updated Southwest Trenches lithology, and updated site soil chemistry data.
Project Personnel:	Task Manager: Mary L. Stallard, Weiss Associates Task Technical Performance: Zafer Demir, Weiss Associates; Tim R. Utterback, Weiss Associates

Approach:

- The updated RBAS value for mercury was calculated by the same approach used in the Draft Determination of Risk-Based Action Standards for DOE Areas, Weiss Associates, 1997 with updates to chemical specific parameters, site specific conditions, and soil chemistry data. Calculations were performed for Scenario 2.
- Calculations were performed for Mercury and Compounds.
- Site conditions were updated for the distribution of Mercuric compounds in the Southwest Trenches subsurface.
- Reference doses obtained from the IRIS database for risk calculations were also updated for each chemical to ensure conservatism.

Results:

	RfDo (mg/kg-day)	Kd (L/Kg)	RBAS (mg/kg)
$HgCl_2$	0.0003	52	3.1
CH3Hg	0.0001	52	1.0
HgS	0.0003	52	3.1

Note:
RBAS based on RfD_o and K_d from the U.S. Environmental Protection Agency Superfund Chemical Data Matrix. RfD_o for both mercuric chloride and mercuric sulfide is USEPA value for "mercury and compounds." This value is based on toxicological data for $HgCl_2$ and is considered conservative for HgS. Toxicological studies performed for Oakridge National Laboratory (ORNL) indicate HgS adsorption by GI tract is five times less than $HgCl_2$. RfD_o developed for HgS at ORNL is 133 times the HgCl2 RfD_o.

Abbreviations:

CH3Hg	L/Kg
HgCl2	mg/kg
HgS	RBAS
Kd	RfDo

Appendix D. Mercury RBAS Calculations

Scenario #2: East Residential Farmer Scenario

Source	Transport Mechanism	Exposure Route	Pathway Complete ?	Rationale
Soil contamination	Direct contact	Dermal Exposure	no	No direct access to onsite soil assumed.
		Direct Ingestion	no	Resident assumed not to cross LEHR site boundary and ingest source soil directly.
	Migration in saturated/unsaturated zone via diffusion, advection, etc.	Ground water ingestion	yes	Ground water ingestion from residential well assumed. Receptor is downgradient of DOE OUs.
	Subsurface diffusion/volatilization	Inhalation of VOCs	no	Air monitoring at perimeter stations has not shown significant levels of volatiles. Volatiles assumed to be lost from particulates prior to off-site transport.
	Dispersion and deposition of particulates in air	Inhalation of particulates	yes	Assumed off-site transport of particulates generated on-site. Not complete for volatiles.
		Deposition with dermal exposure/Direct ingestion	yes	Assumed off-site transport of particulates followed by direct exposure. Pathway not complete for volatiles.
		Deposition with impacted food ingestion	yes	Assumed off-site transport and deposition of particulates followed by food pathway uptake. Pathway not complete for volatiles.
	Precipitation and surface water runoff	Incidental ingestion of surface water	yes	Incidental ingestion while swimming assumed possible. All pathways complete only for those contaminants present LEHR site surface soils > background, AND present in stormwater runoff from DOE OUs.
		Dermal exposure to surface water	yes	Dermal contact during swimming assumed.
		Aquatic food ingestion	yes	Residents assumed to ingest aquatic food from Putah Creek.
	Direct exposure	External radiation	yes	Assumed off-site transport of particulates containing radionuclides.

Updated Southwest Trenches Lithology - One Dimensional Vadose Zone Modeling, LEHR

Soil Type **Parameter**	**Unit**	**NSAND Sand**	**NCLYSLT Clayey Sandy Silt**
Solid density (rs)	kg/m3	2630	2570
Bulk Density (rB)	kg/m3	1415	1720
Vertical Hydraulic Conductivity (Kz)	cm/sec	1.27E-04	7.08E-05
	m2	1.29E-13	7.22E-14
Porosity (f)	%	0.312	0.354
Residual Moisture Content (qr)	% vol	0.0624	0.15576
Satiated Moisture Content (qs)	% vol	0.312	0.354
Van Genuchten Parameters			
n		1.4285	1.4070
m = 1 - (1/n)		0.3000	0.2893
a	1/cm	0.0639	0.0211
a	1/Pa	6.520E-04	2.150E-04
Residual Saturation (Sr = qr/f)	% vol	0.2000	0.4400
Maximum Saturation (Smax = qs/f)	%vol	1.0000	1.0000
Tortuosity Factor (ta)	%	Millington(1961)	Millington(1961)
Kd			
All mercury species	ml/g	52.0000	52.0000
Normalized Kd(all species)	-	235.8333	252.6554

Scenario 2, Summary of Forward Calculation Hazard Quotients for Chemical Non-Carcinogens assuming a soil concentration of 100 mg/kg.

Target HQ 1.00E+00

Analyte	Soil Conc. (mg/kg)	Ground Water Ingestion HQ	Swimming Ingestion HQ	Dermal Swimming HQ	Dermal Showering HQ	Soil Ingestion HQ	Dermal Soil HQ	Inhalation HQ	Fish Ingestion HQ	Plant Ingestion HQ	Meat Ingestion HQ	Milk Ingestion HQ	HQ Across Pathways
Mercury (Hg)	100	1.66E+01	4.08E-03	3.61E-04	8.10E-02	3.72E-07	1.03E-08	2.03E-07	1.57E+01	1.47E-05	1.74E-04	2.87E-06	3.234E+01

Scenario 2, Summary of Soil Action Standards and Pathway-Specific Hazard Quotients for Chemical Non-Carcinogens at a Hazard Quotient of 1.0.

Analyte	LEHR Site Action Standard mg/kg	Pathway-Specific Hazard Quotient at Action Standards: Ground Water Ingestion	Swimming Ingestion	Dermal Swimming	Dermal Showering	Soil Ingestion	Dermal Soil	Inhalation	Fish Ingestion	Plant Ingestion	Meat Ingestion	Milk Ingestion	HQ Across Pathways
Mercury (Hg)	3.09	5.1E-01	1.3E-04	1.1E-05	2.5E-03	1.1E-08	3.2E-10	6.3E-09	4.8E-01	4.5E-07	5.4E-06	8.9E-08	1.0

NC = Exposure pathway not complete for chemical.

Ground Water Ingestion Pathway

Scenario 2, Soil to Ground Water (Vadose Zone) On-site - On-site Ground Water to Receptor.

NUFT-SOLUTE Modeling - see Attachment F (WA, 1997).

Note on previous approach (Weiss Associates, August 1997)
Note on current approach (December, 1999)

	Ground Water/Soil Ratio (mg/L)/(mg/kg)
HgS	
Kd= 52	5.44E-04

Scenario 2, Forward HQ Calculation - Non-Carcinogens, Ground Water Concentration Conversion Factors, .

Analyte	Soil Concentration (0-15 ft bgs) (mg/kg)	Ground Water/Soil Ratio (mg/L)/(mg/kg)	Ground Water Concentration (mg/L)
Mercury (Hg)	100	5.44E-04	5.44E-02

Summary Table

Scenario 2, Forward HQ Calculation - Ingestion of chemicals in drinking water.

Chemical	CW (mg/L)	Child IR (L/d)	Adult IR (L/d)	EF (d/yr)	Child ED (yr)	Adult ED (yr)	Child BW (Kg)	Adult BW (Kg)	Child AT (days)	Adult AT (days)	I (mg/kg-day)	RfDo (mg/kg-day)	HQ (unitless)
Mercury (Hg)	5.44E-02	1.0	2	350	6	24	15	70	2190	8760	4.97E-03	0.0003	1.66E+01

CW = Chemical Concentration in Water (mg/L)
IR = Ingestion Rate (L/d)
EF = Exposure Frequency (d/yr)
ED = Exposure Duration (yr)
BW = Body Weight (Kg)
AT = Averaging Time (days)
I = Intake (mg/kg-day) = $CW \times IR_{child} \times EF \times ED_{child} / BW_{child} / AT_{child} + CW \times IR_{adult} \times EF \times ED_{adult} / BW_{adult} / AT_{adult}$
RfDo = Oral Reference Dose (mg/kg-d)
HQ = Calculated Hazard Quotient (unitless) = I / RfDo

Surface Water Concentration Calculation

Storm Water Runoff Modeling - see Attachment E (WA, 1997).

Scenario 2, Forward HQ Calculation - Possible LEHR Impact of Non-Radionuclides to Putah Creek Surface Water

Contaminant of Concern	OU1/OU2 Surface Soil Concentration MAX (mg/kg)	AVERAGE (mg/kg)	SWL-1/SWL-2 Storm Water Concentration MAX (mg/L)	AVERAGE (mg/L)	Dilution Factor MIN (-)	AVERAGE (-)	Putah Creek Conc. PCU/PCD Only MAX (mg/L)	AVERAGE (mg/L)	Putah Creek Conc. Contributed by LEHR MAX (mg/L)	AVERAGE (mg/L)	Putah Creek Conc. From LEHR/ Surface Soil Conc. MAX (mg/L)/(mg/kg)	AVERAGE (mg/L)/(mg/kg)
Mercury	5.70E-01	3.10E-01	<2.00E-04	<2.00E-04	3.65E+01	1.37E+02	9.00E-04	5.00E-04	5.48E-06	1.46E-06	9.61E-06	4.72E-06

The following Contract Reporting Detection Limits were used because the particular analyte was not reported to have been detected in the particular set of samples:
Detection limit of 0.0002 mg/L used for Storm Water Concentration of Mercury.
Calculations:
Dilution Factor = Creek Flow/Storm Runoff Flow
Putah Creek Concentration Contributed by LEHR = Storm Water Concentration/Dilution Factor

Scenario 2, Forward Calculation of Concentration Ratio, Concentration in Putah Creek/Concentration in On-site Soil

Chemical	C_{soil} mg/kg	Csw/Csoil, on-site mg/kg(sw)]/[mg/kg(soil	Csw mg/kg
Mercury (Hg)	100	4.72E-06	4.72E-04

Swimming Ingestion/Dermal Pathways

Scenario 2, Forward HQ Calculation - Ingestion of Chemicals in Surface Water While Swimming.

Summary Table

Chemical	CW (mg/L)	CR (L/d)	EF (d/yr)	Child ED (yr)	Adult ED (yr)	Child BW (Kg)	Adult BW (Kg)	Child AT (days)	Adult AT (days)	I (mg/kg-day)	RfDo (mg/kg-day)	HQ (unitless)
Mercury (Hg)	4.72E-04	0.13	90	6	24	15	70	2190	8760	1.22547E-06	0.0003	4.08E-03

CW = Chemical Concentration in Water (mg/L)
CR = Contact Rate (L/d)
EF = Exposure Frequency (d/yr)
ED = Exposure Duration (yr)
BW = Body Weight (Kg)
AT = Averaging Time (days)
I = Intake (mg/kg-day) = $CW \times CR_{child} \times EF \times ED_{child} / BW_{child} / AT_{child} + CW \times CR_{adult} \times EF \times ED_{adult} / BW_{adult} / AT_{adult}$
RfDo = Oral Reference Dose (mg/kg-d)
HQ = Calculated Hazard Quotient (unitless) = I / RfDo

Summary Table

Scenario 2, Forward HQ Calculation - Dermal Contact With Chemicals in Surface Water While Swimming

Chemical	CW (mg/L)	SA (cm2)	PC (cm/hr)	ET (hr/d)	EF (d/yr)	Child ED (yr)	Adult ED (yr)	CF (1L/1000cm3)	Child BW (Kg)	Adult BW (Kg)	Child AT (days)	Adult AT (days)	AD (mg/kg-day)	RfDo (mg/kg-day)	HQ (unitless)
Mercury (Hg)	4.72E-04	23,000	0.001	0.5	90	6	24	0.001	15	70	2190	8760	1.08407E-07	0.0003	3.61E-04

CW = Chemical Concentration in Surface Water (mg/L)
SA = Skin Surface Area Available for Contact (cm^2)
PC = Dermal Permeability Constant (cm/hr) - chemical specific. Values from Table I-1.
ET = Exposure Time (hr/d)
EF = Exposure Frequency (d/yr)
ED = Exposure Duration (yr)
CF = Volumetric Conversion Factor for Water (1L/1000cm^3)
BW = Body Weight (Kg)
AT = Averaging Time (days)
AD = Absorbed Dose (mg/kg-day) = $CW \times SA \times PC \times ET \times EF \times ED_{child} \times CF / BW_{child} / AT_{child} + CW \times SA \times PC \times ET \times EF \times ED_{adult} \times CF / BW_{adult} / AT_{adult}$
RfDo = Oral Reference Dose (mg/kg-d)
HQ = Calculated Hazard Quotient (unitless) = AD / RfDo

Showering - Dermal Pathway

Scenario 2, Forward HQ Calculation - Dermal Contact With Chemicals in Water While Showering.

From GW ingestion

Summary Table

Chemical	CW (mg/L)	SA (cm^2)	PC (cm/hr)	ET (hr/d)	EF (d/yr)	Child ED (yr)	Adult ED (yr)	CF (1L/1000cm^3)	Child BW (Kg)	Adult BW (Kg)	Child AT (days)	Adult AT (days)	AD (mg/kg-day)	RfDo (mg/kg-day)	HQ (unitless)
Mercury (Hg)	5.44E-02	23,000	0.001	0.25	350	6	24	0.001	15	70	2190	8760	2.43E-05	0.0003	8.10E-02

CW = Chemical Concentration in Water (mg/L)
SA = Skin Surface Area Available for Contact (cm^2)
PC = Dermal Permeability Constant (cm/hr) - chemical specific. Values from Table I-1.
ET = Exposure Time (hr/d)
EF = Exposure Frequency (d/yr)
ED = Exposure Duration (yr)
CF = Volumetric Conversion Factor for Water (1L/1000cm^3)
BW = Body Weight (Kg)
AT = Averaging Time (days)
AD = Absorbed Dose (mg/kg-day) = $CW \times SA \times PC \times ET \times EF \times ED_{child} \times CF / BW_{child} / AT_{child} + CW \times SA \times PC \times ET \times EF \times ED_{adult} \times CF / BW_{adult} / AT_{adult}$
RfDo = Oral Reference Dose (mg/kg-d)
HQ = Calculated Hazard Quotient (unitless) = AD / RfDo

Soil Pathways

Scenario 2, On-site to Off-site Soil Concentration Calculation

ISCST3 Modeling- see Attachment D (WA 1997).

Scenario 2, On-site to Off-site Soil Concentration Conversion, Forward HQ Calculation - Non Carcinogens

Analyte	On-site Soil Concentration (0-15 ft bgs) (mg/kg)	-site Soil/On-site S oncentration Rati (mg/kg)/(mg/kg)	Off-site Soil Concentration (mg/kg)

Mercury (Hg)	100	7.88E-08	7.88E-06

Summary Table

Scenario 2, Forward HQ Calculation - Ingestion of Chemicals in Soil

Chemical	CS (mg/kg)	Child IR (mg/d)	Adult IR (mg/d)	CF (10^{-6} kg/mg)	FI (unitless)	EF (d/yr)	Child ED (yr)	Adult ED (yr)	Child BW (Kg)	Adult BW (Kg)	Child AT (days)	Adult AT (days)	I (mg/kg-day)	RfDo (mg/kg-day)	HQ (unitless)
Mercury (Hg)	7.88E-06	200	100	1.00E-06	1	350	6	24	15	70	2190	8760	1.12E-10	0.0003	3.72E-07

CS = Chemical Concentration in Soil (mg/kg)
IR = Ingestion Rate (mg/d)
CF = Conversion Factor (10^{-6} kg/mg)
FI = Fraction Ingested From Contaminated Source (unitless)
EF = Exposure Frequency (d/yr)
ED = Exposure Duration (yr)
BW = Body Weight (Kg)
AT = Averaging Time (days)
I = Intake (mg/kg-day) = CS x IR_{child} x CF x FI x EF x ED_{child} / BW_{child} / AT_{child} + CS x IR_{adult} x CF x FI x EF x ED_{adult} / BW_{adult} / AT_{adult}
RfDo = Oral Reference Dose (mg/kg-d)
HQ = Calculated Hazard Quotient (unitless) = I / RfDo

Summary Table

Scenario 2, Forward HQ Calculation - Dermal Contact With Chemicals in Soil

Chemical	CS (mg/kg)	CF (10^{-6} kg/mg)	Child SA (cm^2)	Adult SA (cm^2)	AF (mg/cm^2)	ABS (unitless)	EF (d/yr)	Child ED (yr)	Adult ED (yr)	Child BW (Kg)	Adult BW (Kg)	Child AT (days)	Adult AT (days)	AD (mg/kg-day)	RfDo (mg/kg-day)	HQ (unitless)
Mercury (Hg)	7.88E-06	1.00E-06	2,000	5,000	0.2	0.01	350	6	24	15	70	2190	8760	3.09E-12	0.0003	1.03E-08

CS = Chemical Concentration in Soil (mg/kg)
CF = Conversion Factor (10^{-6} kg/mg)
SA = Skin Surface Area Available for Contact (cm^2)
AF = Soil to Skin Adherence Factor (mg/cm^2)
ABS = Absorption Factor (unitless)
EF = Exposure Frequency (d/yr)
ED = Exposure Duration (yr)
BW = Body Weight (Kg)
AT = Averaging Time (days)
AD = Absorbed Dose (mg/kg-day) = CS x CF x SA_{child} x AF x ABS x EF x ED_{child} / BW_{child} / AT_{child} + CS x CF x SA_{adult} x AF x ABS x EF x ED_{adult} / BW_{adult} / AT_{adult}
RfDo = Oral Reference Dose (mg/kg-d)
HQ = Calculated Hazard Quotient (unitless) = AD / RfDo

Inhalation Pathway

Scenario 2, Indoor and Outdoor Air Calculations - see Attachment C (WA, 1997).

Scenario 2, Indoor and Outdoor Air Concentration Conversion Factor Calculations, Forward Risk Calculation.

Analyte	Fwd-Calc Soil Conc (mg/kg)	Indoor Air Conversion ($(mg/m^3)/(mg/kg)$)	Outdoor Air Conversion ($(mg/m^3)/(mg/kg)$)	Indoor Air Conc. (mg/m^3)	Outdoor Air Conc. (mg/m^3)
Non-Carcinogens					
Mercury (Hg)	100		5.80E-13	0.000E+00	5.800E-11

Summary Table

Scenario 2, Forward HQ Calculation -Inhalation of Airborne (Vapor Phase) Chemicals

Chemical	Indoor CA_i (mg/m^3)	Outdoor CA_o (mg/m^3)	Child IR (m^3/hr)	Adult IR (m^3/hr)	Indoor ET (hr/d)	Outdoor ET (hr/d)	EF (d/yr)	Child ED (yr)	Adult ED (yr)	Child BW (Kg)	Adult BW (Kg)	Child AT (days)	Adult AT (days)	Indoor I (mg/kg-day)	Outdoor I (mg/kg-day)	RfDi (mg/kg-day)	HQ (unitless)
Mercury (Hg)	0.000E+00	5.800E-11	0.416666667	0.833333333	16.08	7.92	350	6	24	15	70	2190	8760	0	1.7E-11	0.000086	2E-07

CAi = Chemical Concentration in Indoor Air (mg/m^3)
CAo = Chemical Concentration in Outdoor Air (mg/m^3)
IR = Inhalation Rate (m^3/hr)
ET = Exposure Time (hr/d)
EF = Exposure Frequency (d/yr)
ED = Exposure Duration (yr)
BW = Body Weight (Kg)
AT = Averaging Time (days)
I_{indoor} = Indoor Air Intake (mg/kg-day) = CA_{indoor} x IR_{child} x ET_{indoor} x EF x ED_{child} / BW_{child} / AT_{child} + CA_{indoor} x IR_{adult} x ET_{indoor} x EF x ED_{adult} / BW_{adult} / AT_{adult}
$I_{outdoor}$ = Outdoor Air Intake (mg/kg-day) = $CA_{outdoor}$ x IR_{child} x $ET_{outdoor}$ x EF x ED_{child} / BW_{child} / AT_{child} + $CA_{outdoor}$ x IR_{adult} x $ET_{outdoor}$ x EF x ED_{adult} / BW_{adult} / AT_{adult}
RfDo = Oral Reference Dose (mg/kg-d)
HQ = Calculated Hazard Quotient (unitless) = (I_{indoor} + $I_{outdoor}$) / RfDo

Fish Ingestion

Scenario 2. Fish Calculation - see Attachment G (WA, 1997)

Surface Water

Inorganic Chemical *Non-Carcinogens*	Csw mg/L	Bcf L/kg	Cfish mg/kg	Csoil mg/kg	Cfish/Csoil, on-site ng/kg(fish)]/[mg/kg(soil)]
Mercury (Hg)	4.7E-04	64000	3.02E+01	100	3.02E-01

Kow = Octanol/water partition coefficient.
Bcf = Bioconcentration factor for fish (L/kg)
Csw = Chemical concentration in surface water contributed by the LEHR site (mg/L)
CFish = COC concentration in fish (mg/kg).

a = Values from Fetter, 1993; Lyman et al, 1990; CalEPa, 1994; Stephens, 1996; USDOE, 1996; Weiss Associates, 1997.
b = Log(Bcf) = 0.76 Log(Kow) - 1.23, Veith et al., 1980.
c = Cfish = Csw x Bcf, CalEPA, 1993.
d = Values from Aquire database, USEPA, 1996. Chromium, barium, molybdenum, thallium and vanadium from PNNL, 1996.

Scenario 2. Forward Calculation of Concentration Ratio, Concentration in Off-site Fish Media/Concentration in On-site Soil

Organic Chemical	Csoil, on-site mg/kg	Cfish/Csoil, on-site ng/kg(fish)]/[mg/kg(soi	Cfish mg/kg
Non-Carcinogens			
Mercury (Hg)	100	3.02E-01	3.02E+01

Summary Table

Scenario 2, Forward HQ Calculation - Ingestion of Chemicals in Fish

Chemical	CF (mg/kg)	IR (kg/day)	FI (unitless)	EF (days/yr)	Child ED (yr)	Adult ED (yr)	Child BW (Kg)	Adult BW (Kg)	Child AT (days)	Adult AT (days)	I (mg/kg-day)	RfDo (mg/kg-day)	HQ (unitless)
Mercury (Hg)	3.02E+01	0.054	0.5	26	6	24	15	70	2190	8760	0.004705797	0.0003	1.57E+01

CF = Chemical Concentration in Fish (mg/kg)
IR = Ingestion Rate (kg/meal)
FI = Fraction Ingested From Contaminated Source (unitless)
EF = Exposure Frequency (meals/yr)
ED = Exposure Duration (yr)
BW = Body Weight (Kg)
AT = Averaging Time (days)
I = Intake (mg/kg-day) = CF x IR x FI x EF x ED_{child} / BW_{child} / AT_{child} + CF x IR x FI x EF x ED_{adult} / BW_{adult} / AT_{adult}
RfDo = Oral Reference Dose (mg/kg-d)
HQ = Calculated Hazard Quotient (unitless) = I / RfDo

Fruit and Vegetable Ingestion

Scenario 2. Vegetable and Fruit Media Calculation -see Attachment F (WA, 1997).

Inorganic Chemic	Csoil mg/kg	Cap mg/m3	Css mg/Kg	Kpapt m3/Kg(fm)	Kps Kg/Kg(dm) e	biodim Kg(dm)/Kg(fm) f	Cveg mg/Kg(fm) g	Cveg/Csoil [mg/kg(fm)]/ [mg/kg(soil)]
Non-Carcinogens								
Mercury (Hg)	100	5.8E-11	0.00000788	3300	0.9	0.2	1.42E-06	1.42E-08

Kow = Octanol/Water partition coefficient.
Cap = COC concentration in particulate phase of ambient outdoor air at exposure location from chemical deposition calculation (ug/m3) or (pCi/m3).
Css = COC concentration in surface soil at exposure location from chemical deposition calculation (mg/kg) or (pCi/kg).
Kpapt = Plant-air partition coefficient for particle bound contamination (m3-air / kg-plant fresh mass).
Kps = Plant-soil partition coefficient ((mg/kg-plant fresh mass)/(mg/kg-soil)) = (kg-soil/kg-plant fresh mass).
biodim = Ratio of vegetable/fruit dry mass to fresh mass (kg-dry mass)/(kg-fresh mass).
Cveg = COC concentration in vegetable/fruit media (mg/kg-fresh mass) or (pCi/kg-fresh mass).

a = Values from Fetter, 1993; Lyman et al, 1990; CalEPA, 1994; Stephens, 1996; USDOE, 1996; Weiss Associates, 1997.
b = Value from McKone and Ryan, 1989.
c = Organic compounds: Kps (Kg/Kgfm) = 7.7 Kow-0.58 Travis and Arms, 1988.
d = Calculation for organic compounds: Cveg = Cap x Kpapt + Css x Kps. Cal EPA, 1993.
e = Values from Baes et al., 1984.
f = Value from Cal EPA, 1993.
g = Calculation for inorganic compounds and radionuclides: Cveg = Cap x Kpapt + Css x Kps x biodim. Cal EPA, 1993.

Scenario 2. Forward Calculation of Concentration Ratio - Concentration in Off-site Vegetation/Concentration in On-site Soil

Chemical	Csoil mg/kg	Cveg/Csoil ng/kg(fm)]/[mg/kg(soil	Cveg mg/kg(fm)
Non-Carcinogens			
Mercury (Hg)	100	1.42E-08	1.42E-06

Summary

Summary Table

Scenario 2, Forward HQ Calculation - Ingestion of Chemicals in Fruits and Vegetables

Chemical	CF (mg/kg)	IR (kg/day)	FI (unitless)	EF (days/yr)	Child ED (yr)	Adult ED (yr)	Child BW (Kg)	Adult BW (Kg)	Child AT (days)	Adult AT (days)	I (mg/kg-day)	RfDo (mg/kg-day)	HQ (unitless)
Mercury (Hg)	1.42E-06	0.08	0.5	350	6	24	15	70	2190	8760	4.40E-09	0.0003	1.47E-05

CF = Chemical Concentration in Food (mg/kg)
IR = Ingestion Rate (kg/day)
FI = Fraction Ingested From Contaminated Source (unitless)
EF = Exposure Frequency (days/yr)
ED = Exposure Duration (yr)
BW = Body Weight (Kg)
AT = Averaging Time (days)
I = Intake (mg/kg-day) = CF x IR x FI x EF x ED_{child} / BW_{child} / AT_{child} + CF x IR x FI x EF x ED_{adult} / BW_{adult} / AT_{adult}
RfDo = Oral Reference Dose (mg/kg-d)
HQ = Calculated Hazard Quotient (unitless) = I / RfDo

Meat Ingestion

Scenario 2. Beef Calculation - see Attachment F (WA, 1997).

Inorganic Chemical	Bt (inorganics) d/kg f	Cap mg/m3	Css mg/kg	Inhc m3/d	Kpapt m3/kg	Ivbc kg(fm)/d	Isc kg/d	Kps kg/kg[dm] g	biodim kg(dm)/kg(fm) h	Cbeef mg/kg	Csoil, on-site mg/kg	Cbeef/Csoil, on-site (mg/kg)/(mg/kg)
Non-Carcinogens												
Mercury (Hg)	0.027	5.8E-11	0.00000788	122	3300	60	0.4	0.9	0.2	2.69317E-06	100	2.69E-08

Kow = Octanol/water partition coefficient.
Bt = Biotransfer factor for beef cattle (d/kg).
Cap = COC concentration in particulate phase of ambient outdoor air at exposure location from chemical deposition calculation (ug/m3).
Css = COC concentration in surface soil at exposure location from chemical deposition calculation (mg/kg).
Inhc = Daily inhalation rate of cattle (m3/d)
Kpapt = Plant-air partition coefficient for particle-bound contamination (m3-air / kg-plant fresh mass).
Ivbc = Ingestion of pasture by beef cattle (kg-fresh mass/day).
Isc = Ingestion of soil by cattle (kg/day)
Kps = Plant-soil partition coefficient ((mg/kg-plant dry mass)/(mg/kg-soil)) = (kg-soil/kg-plant dry mass).
biodim = Ratio of vegetable/fruit dry mass to fresh mass (kg-dry mass)/(kg-fresh mass).
Cbeef = COC concentration in beef media (mg/kg)

a = Values from Fetter, 1993; Lyman et al, 1990; CalEPA, 1994; Stephens, 1996; USDOE, 1996; Weiss Associates, 1997.
b = Log(Bt) = Log(Kow) - 7.6, Travis and Arms, 1988.
c = Value from McKone and Ryan, 1989.
d = Organic compounds: Kps = 7.7 Kow-0.58 (Travis and Arms, 1988).
e = Calculation: Cbeef = Cap x (Inhc + Kpapt x Ivbc) x Bt + Css x (Isc + Kps x biodim x Ivbc) x Bt. (Cal EPA, 1993).
f = Values from Ng et al., 1982. Except arsenic, beryllium, antimony, selenium, thallium and vanadium from Baes et al., 1984.
g = Values from Baes et al., 1984.
h = Value from Cal EPA, 1993.

Scenario 2. Forward Calculation of Concentration Ratio - Concentration in Off-site Beef Media/Concentration in On-site Soil

Organic Chemical	Csoil, on-site mg/kg	Cbeef/Csoil, on-site mg/kg(beef)]/[mg/kg(soil	Cbeef mg/kg(fm)
Non-Carcinogens			
Mercury (Hg)	100	2.69E-08	2.69E-06

Summary Table

Scenario 2, Forward HQ Calculation - Ingestion of Chemicals in Meat

Chemical	CF (mg/kg)	IR (kg/day)	FI (unitless)	EF (days/yr)	Child ED (yr)	Adult ED (yr)	Child BW (Kg)	Adult BW (Kg)	Child AT (days)	Adult AT (days)	I (mg/kg-day)	RfDo (mg/kg-day)	HQ (unitless)
Mercury (Hg)	2.69E-06	0.25	1	350	6	24	15	70	2190	8760	5.23E-08	0.0003	1.74E-04

CF = Chemical Concentration in Food (mg/kg)
IR = Ingestion Rate (kg/day)
FI = Fraction Ingested From Contaminated Source (unitless)
EF = Exposure Frequency (days/yr)
ED = Exposure Duration (yr)
BW = Body Weight (Kg)
AT = Averaging Time (days)
I = Intake (mg/kg-day) = CF x IR x FI x EF x ED_{child} / BW_{child} / AT_{child} + CF x IR x FI x EF x ED_{adult} / BW_{adult} / AT_{adult}
RfDo = Oral Reference Dose (mg/kg-d)
HQ = Calculated Hazard Quotient (unitless) = I / RfDo

Scenario 2. Milk Media Calculation - see Attachment F (WA, 1997).

Inorganic Chemical	Bk d/Kg f	Cap mg/m3	Css mg/kg	Inhc m3/d	Kpapt m3/kg(fm)	Ivdc kg(fm)/d	Isc kg/d	Kps kg/kg(dm) g	biodim kg(dm)/kg(fm) h	Cmilk mg/kg l	Csoil, on-site mg/kg	Cmilk/Csoil, on-site (mg/kg)/(mg/kg)
Non-Carcinogens												
Mercury (Hg)	0.00045	5.8E-11	0.00000788	122	3300	85	0.4	0.9	0.2	6.30E-08	100	6.30E-10

Kow = Octanol/water partition coefficient.
Bk = Biotransfer factor for dairy cattle (d/kg).
Cap = COC concentration in particulate phase of ambient outdoor air at exposure location from chemical deposition calculation (ug/m3) or (pCi/m3).
Css = COC concentration in surface soil at exposure location from chemical deposition calculation (mg/kg) or (pCi/kg).
Inhc = Daily inhalation rate for cattle (m3/d)
Kpapt = Plant-air partition coefficient for particle-bound contamination (m3-air / kg-plant fresh mass).
Ivdc = Ingestion of pasture by dairy cattle (kg-fresh mass/day).
Isc = Ingestion of soil by cattle (kg/day)
Kps = Plant-soil partition coefficient ((mg/kg-plant fresh mass)/(mg/kg-soil)) = (kg-soil/kg-plant fresh mass).
biodim = Ratio of pasture dry mass to fresh mass (kg-dry mass)/(kg-fresh mass).
Cmilk = COC concentration in dairy milk media (mg/kg) or (pCi/kg).

a = Values from Fetter, 1993; Lyman et al, 1990; CalEPA, 1994; Stephens, 1996; USDOE, 1996; Weiss Associates, 1997.
b = Log(Bk) = Log(Kow) - 8.1, Travis and Arms 1988.
c = Value from McKone and Ryan 1989.
d = Organic compounds: Kps (Kg/Kgfm) = 7.7 Kow-0.58 Travis and Arms, 1988.
e = Calculation for organic compounds: Cmilk = Cap x (Inhc + Kpapt x Ivdc) x Bk + Css x (Isc + Kps x Ivdc) x Bk. Cal EPA, 1993.
f = Values from Baes et al., 1984.
g = Values from Baes et al., 1984.
h = Value from Cal EPA, 1993.
i = Calculation for inorganic compounds and radionuclides: Cmilk = Cap x (Inhc + Kpapt x Ivdc) x Bk + Css x (Isc + Kps x Ivdc x biodim) x Bk. Cal EPA 1993.

Scenario 2. Forward Calculation of Concentration Ratio -Concentration in Off-site Milk Media/Concentration in On-site Soil

Organic Chemical	**Csoil mg/kg**	**Cmilk/Csoil, on-site ng/kg(milk)]/[mg/kg(so**	**Cmilk mg/kg**
Non-Carcinogens			
Mercury (Hg)	100	6.30E-10	6.30E-08

Summary Table

Scenario 2, Forward HQ Calculation - Ingestion of Chemicals in Milk

Chemical	CF (mg/kg)	unit conv CF (mg/L)	IR (L/d)	FI (unitless)	EF (d/yr)	Child ED (yr)	Adult ED (yr)	Child BW (Kg)	Adult BW (Kg)	Child AT (days)	Adult AT (days)	I (mg/kg-day)	RfDo (mg/kg-day)	HQ (unitless)
Mercury (Hg)	6.30E-08	6.52013E-08	0.17	1	350	6	24	15	70	2190	8760	8.60419E-10	0.0003	2.87E-06

CF = Chemical Concentration in Milk (mg/kg)
unit conv for CF = CFmg/kg(milk) x 1.035 kg(milk)/L(milk) = CF mg/L
IR = Ingestion Rate (L/d)
FI = Fraction Ingested From Contaminated Source (unitless)
EF = Exposure Frequency (d/yr)
ED = Exposure Duration (yr)
BW = Body Weight (Kg)
AT = Averaging Time (days)
I = Intake (mg/kg-day) = $CF \times IR \times FI \times EF \times ED_{child} / BW_{child} / AT_{child} + CF \times IR \times FI \times EF \times ED_{adult} / BW_{adult} / AT_{adult}$
RfDo = Oral Reference Dose (mg/kg-d)
HQ = Calculated Hazard Quotient (unitless) = I / RfDo

End of Calculations

Appendix D. Mercury RBAS Calculations

		Hg and Compunds *HgCl2 as basis*	Elemental Hg Hg	Methyl Mercury CH3Hg+	Mercuric Sulfide HgS
PARAMETER	**UNIT**				
MCL	mg/L	0.002			
Mol. Wt.	g/mole	*271.52*	200.59	216	232.68
RfDo	mg/kg-day	0.0003		0.0001	0.04
RfDi	mg/kg-day		0.000086		
Henry's Constant	atm-m3/mole	7.10E-03	7.10E-03	4.70E-07	*7.10E-03*
Kd	mL/g	24,000 - 270,000		2,700 - 31,000	
mean		58000	1000	6700	

Analyte	Kd (ml/g)	Source of Data
Mercury (Hg)	**5.20E+01**	**Superfund Chemical Data Matrix**

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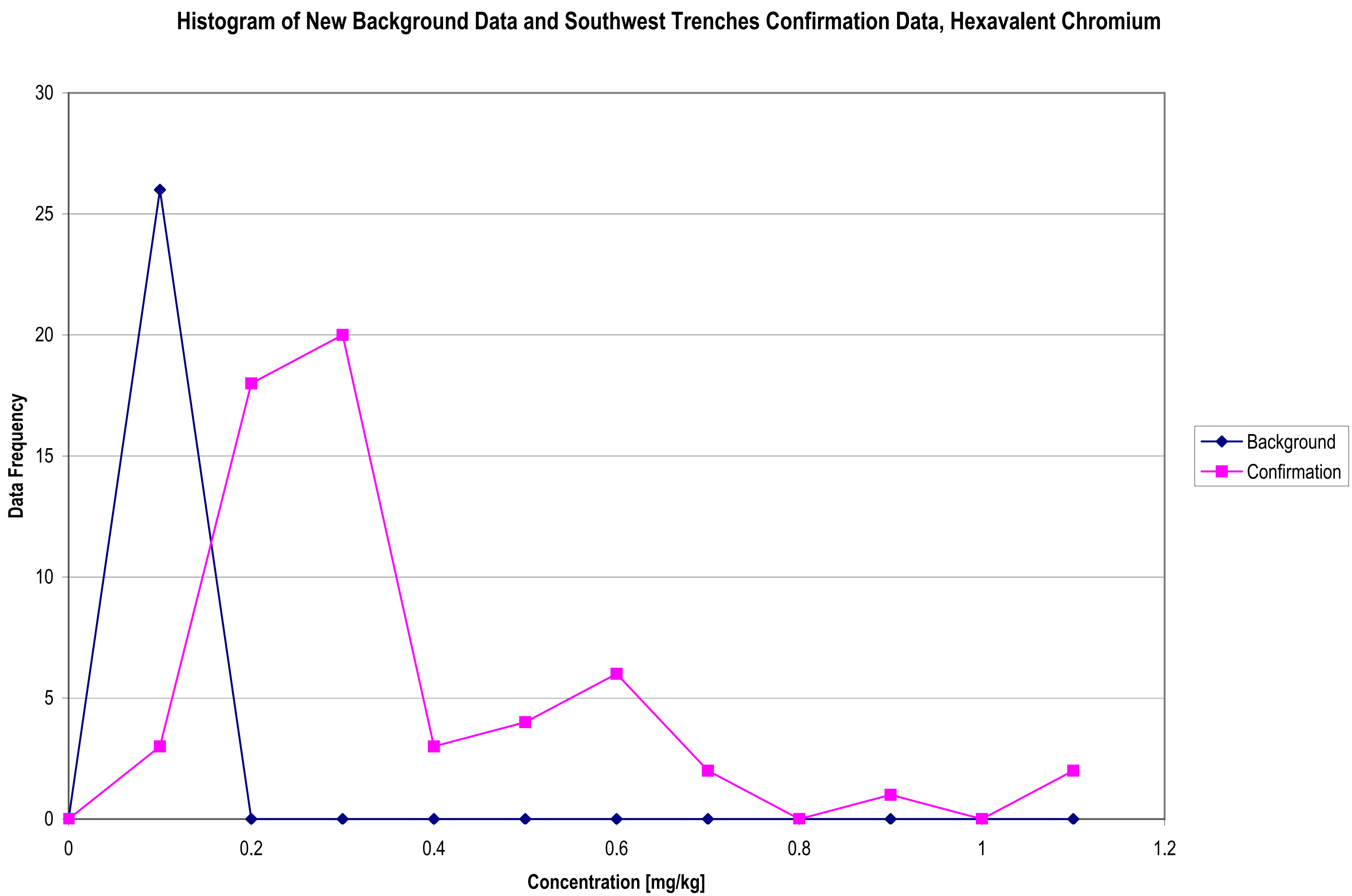
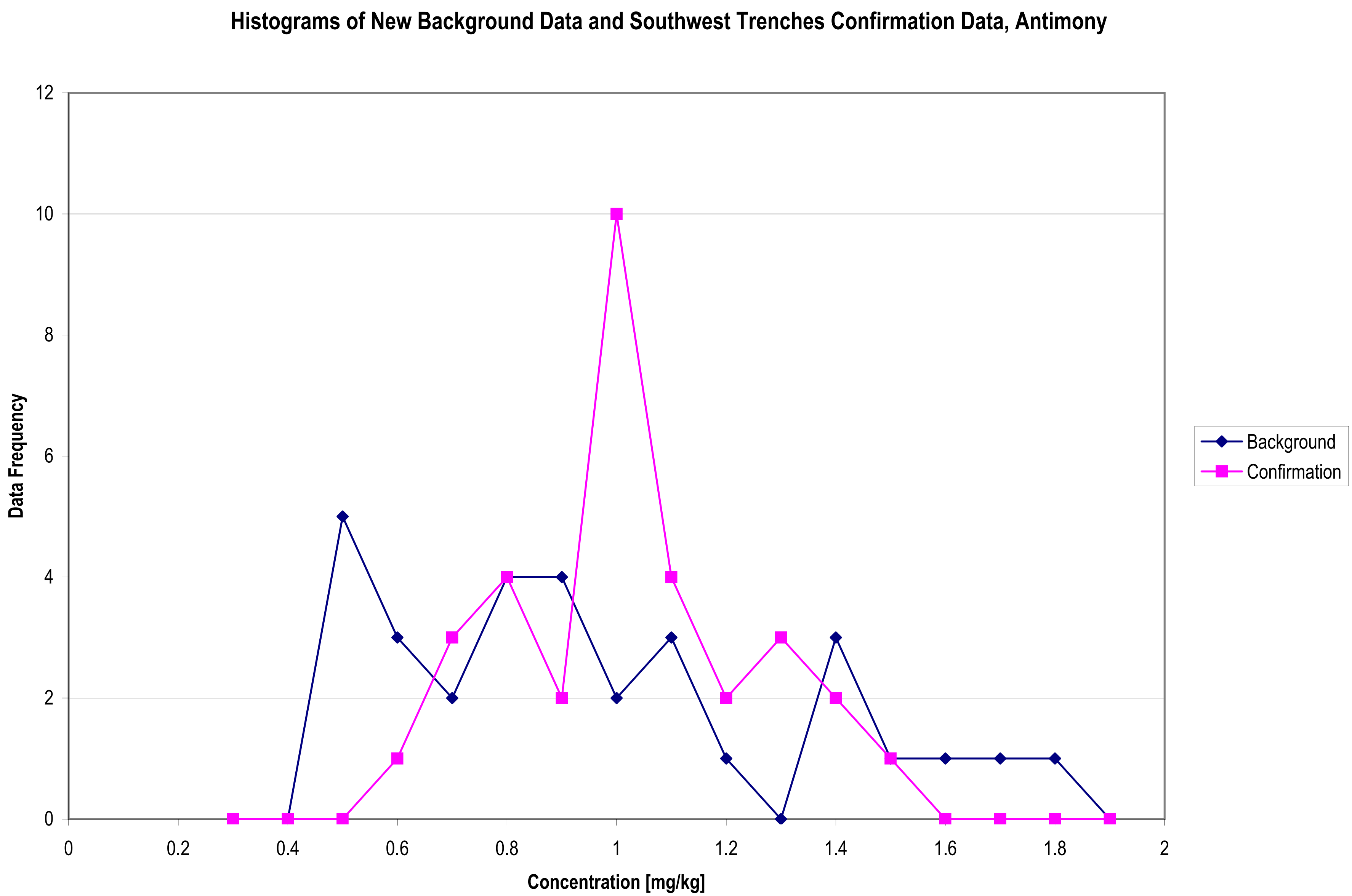
APPENDIX E

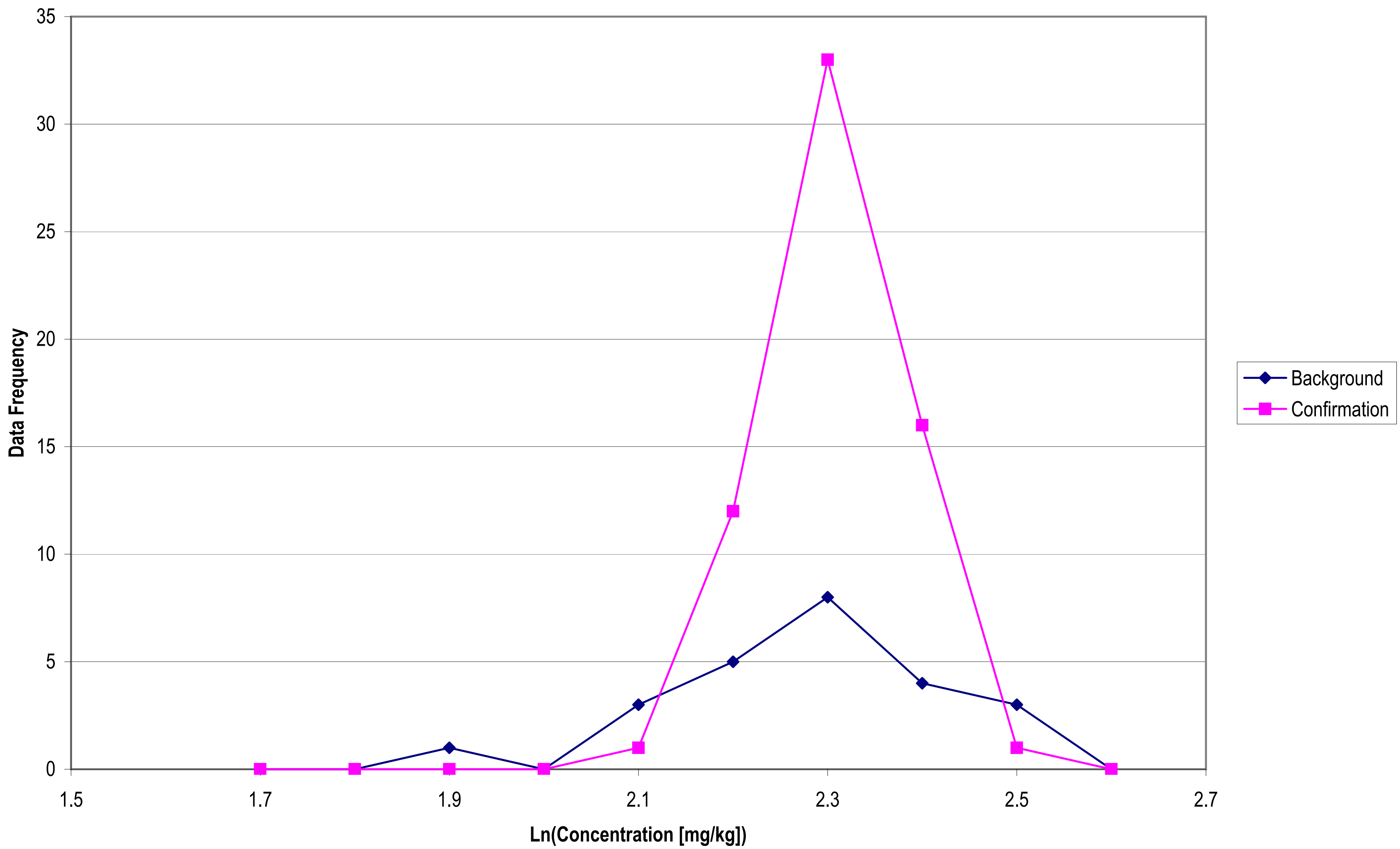
HISTOGRAMS

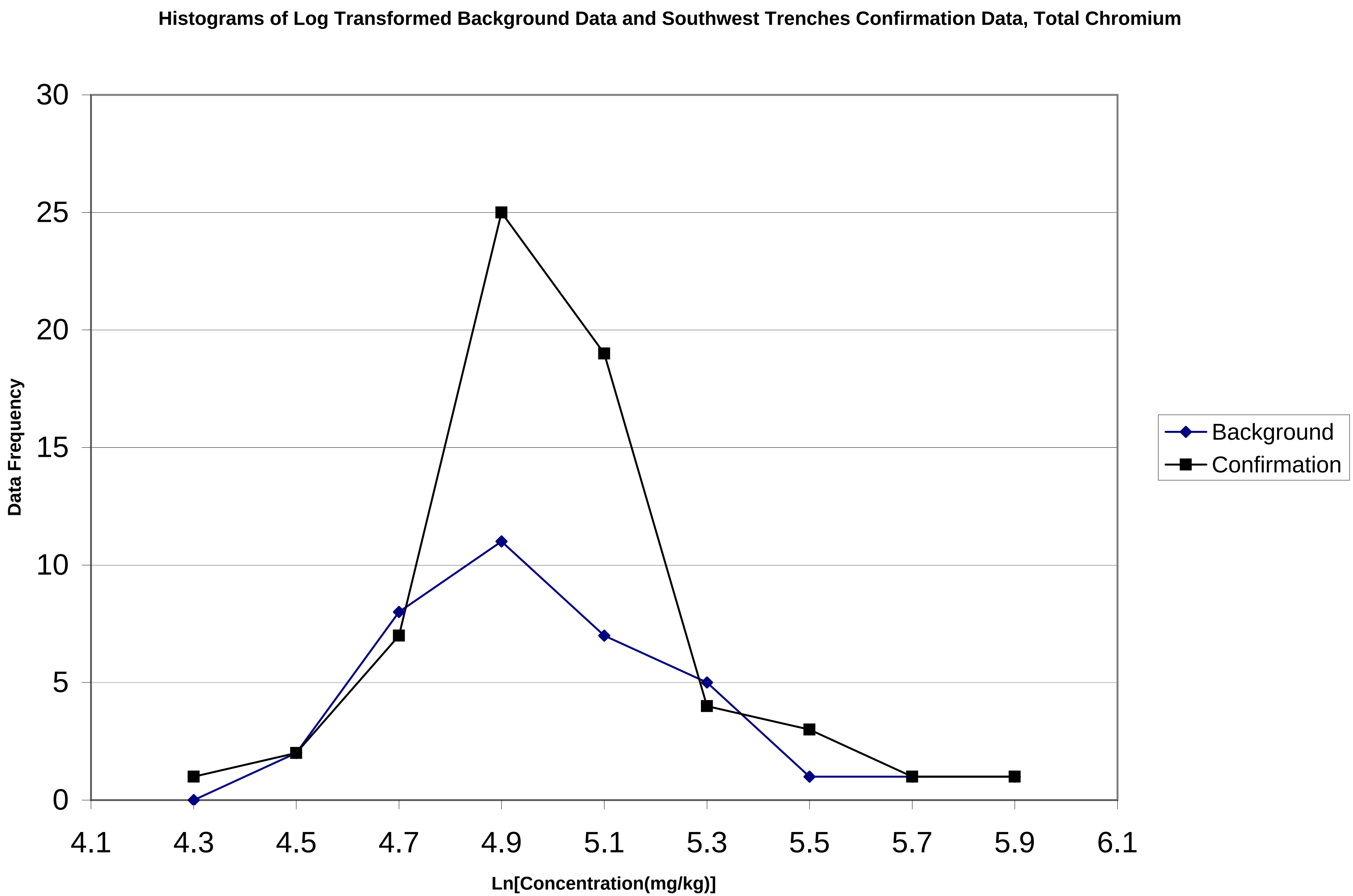


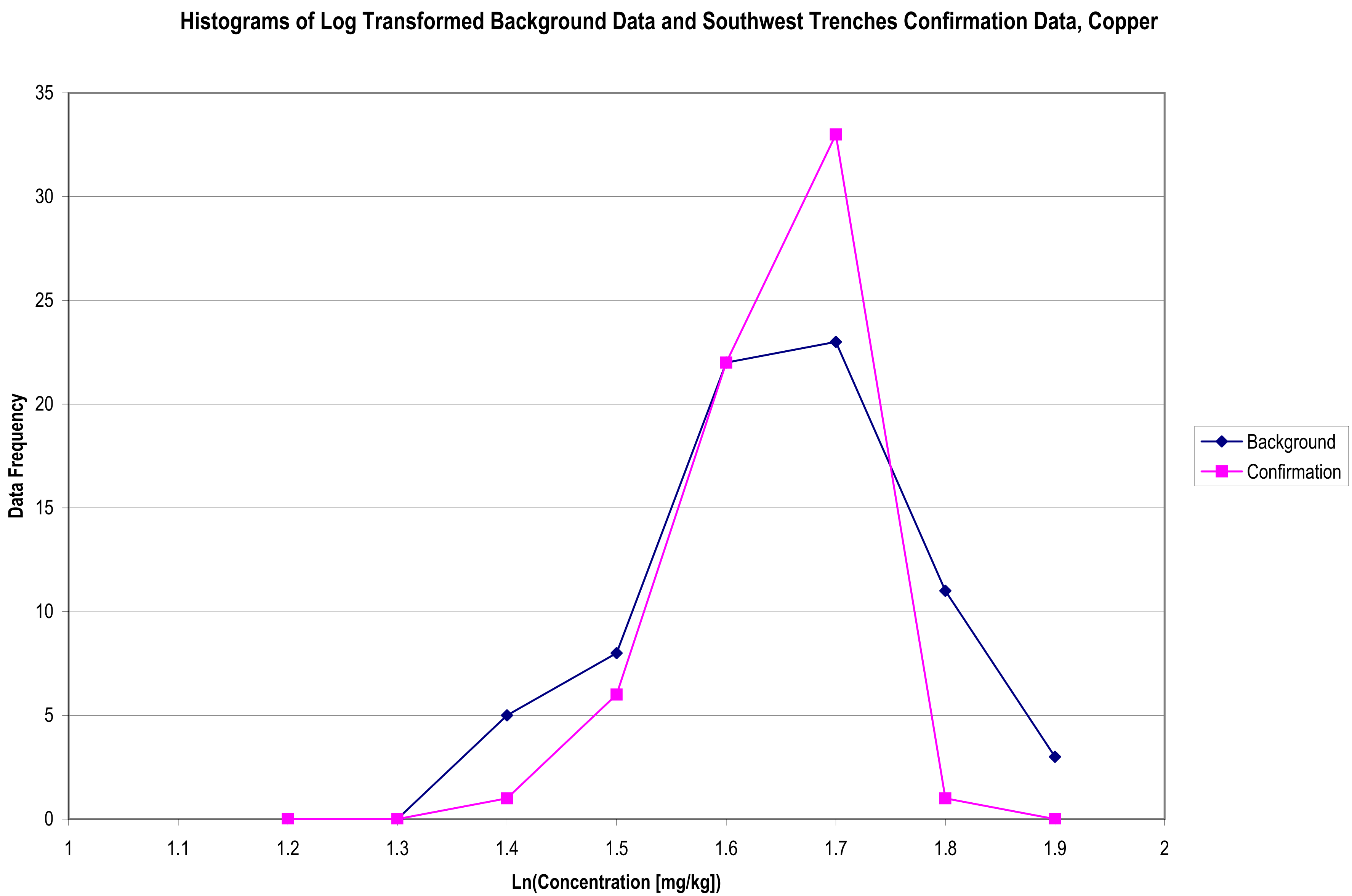
Histogram of New Background Data and Southwest Trenches Confirmation Data, Hexavalent Chromium
Data Frequency
30
25
20
15
10
5
0
0
0.2
0.4
0.6
0.8
1
1.2
Concentration [mg/kg]
Background
Confirmation

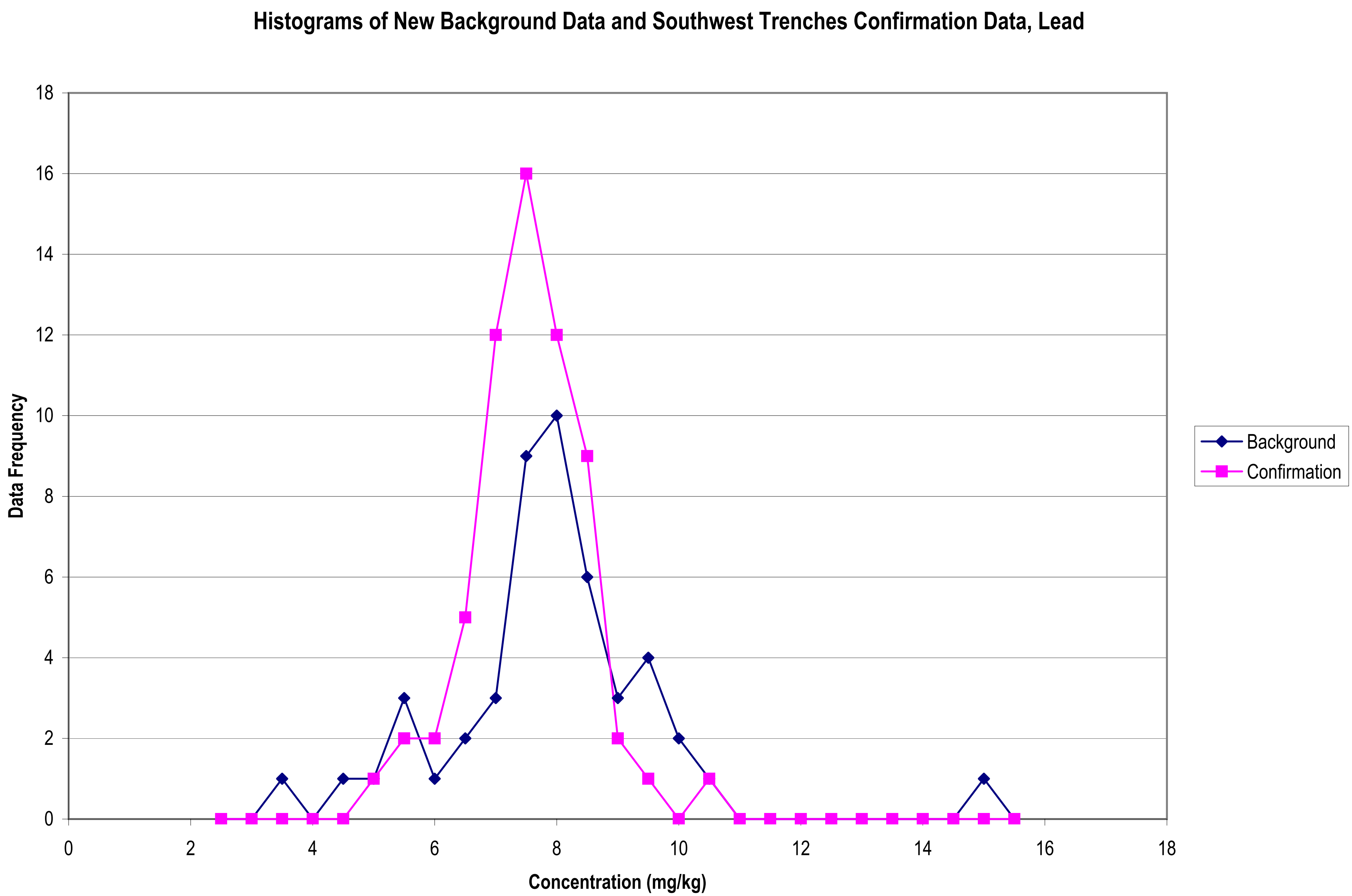

Histograms of New Background Data and Southwest Trenches Confirmation Data, Antimony
Data Frequency
Concentration [mg/kg]
0
2
4
6
8
10
12
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Background
Confirmation

Histograms of Log Transformed Background Data and Southwest Trenches Confirmation Data, Barium



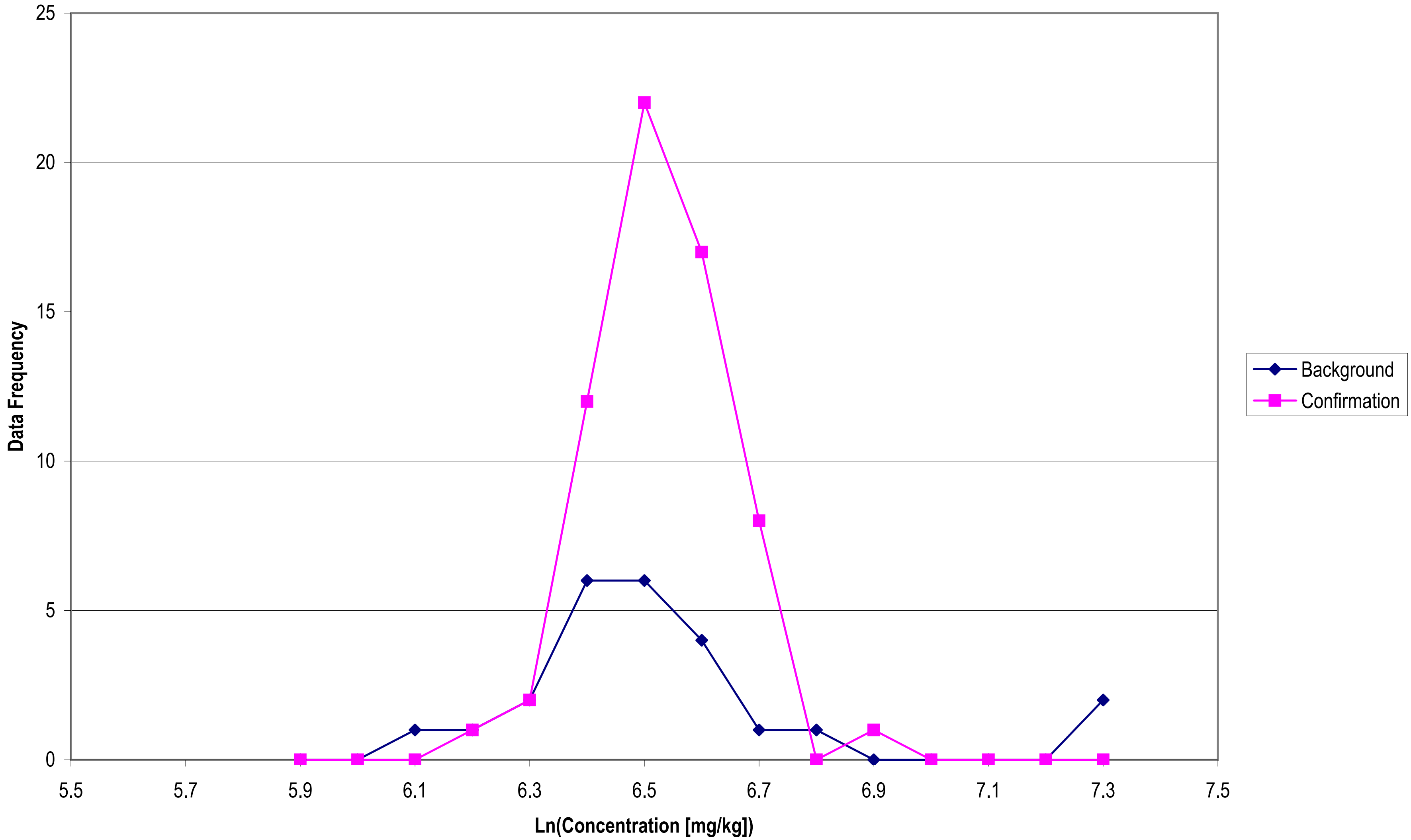

Histograms of Log Transformed Background Data and Southwest Trenches Confirmation Data, Total Chromium
Data Frequency
30
25
20
15
10
5
0
4.1
4.3
4.5
4.7
4.9
5.1
5.3
5.5
5.7
5.9
6.1
Ln[Concentration(mg/kg)]
Background
Confirmation

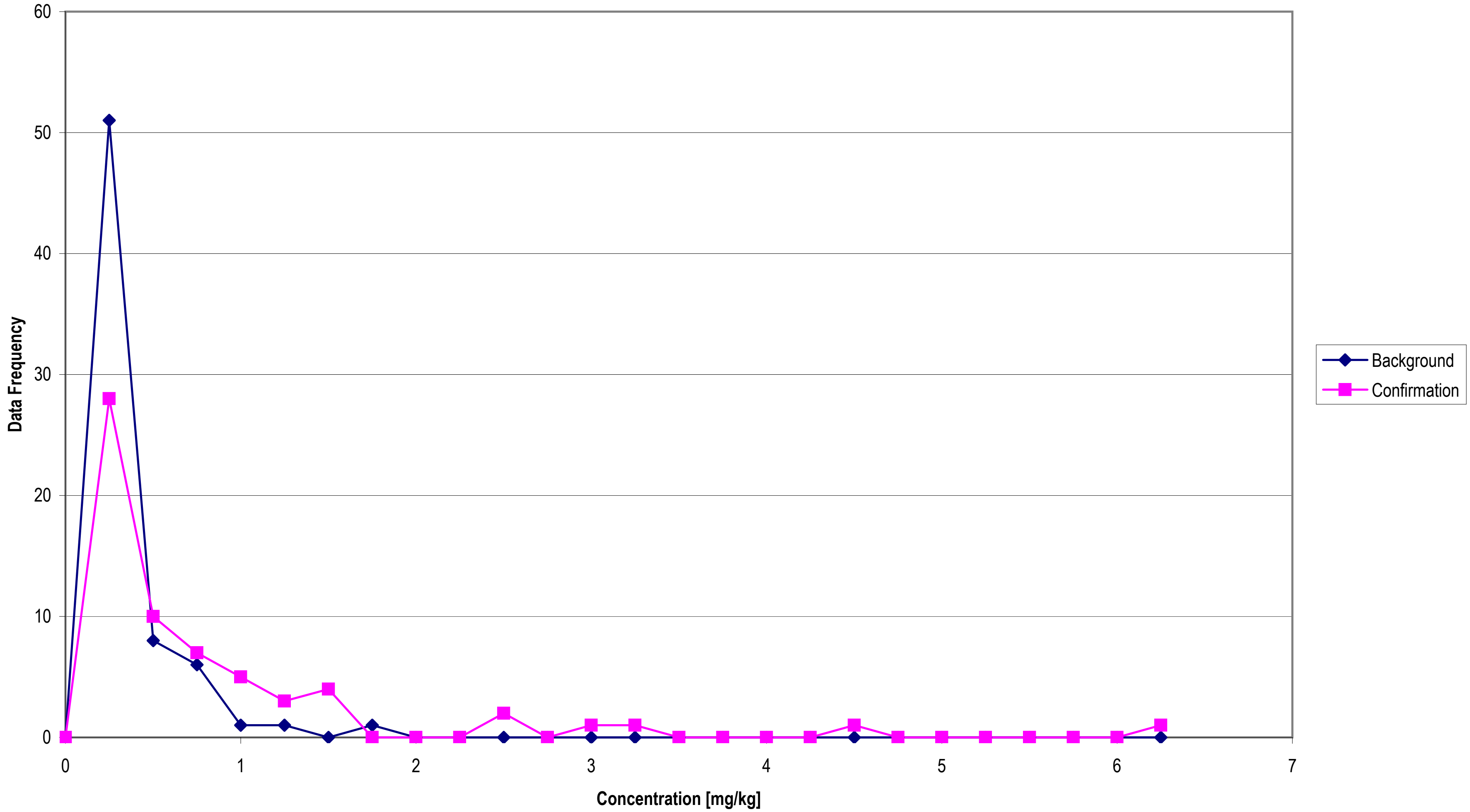

Histograms of Log Transformed Background Data and Southwest Trenches Confirmation Data, Copper
Data Frequency
Ln(Concentration [mg/kg])
Background
Confirmation
0
5
10
15
20
25
30
35
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2



Histograms of New Background Data and Southwest Trenches Confirmation Data, Lead
Data Frequency
Concentration (mg/kg)
Background
Confirmation
0
2
4
6
8
10
12
14
16
18

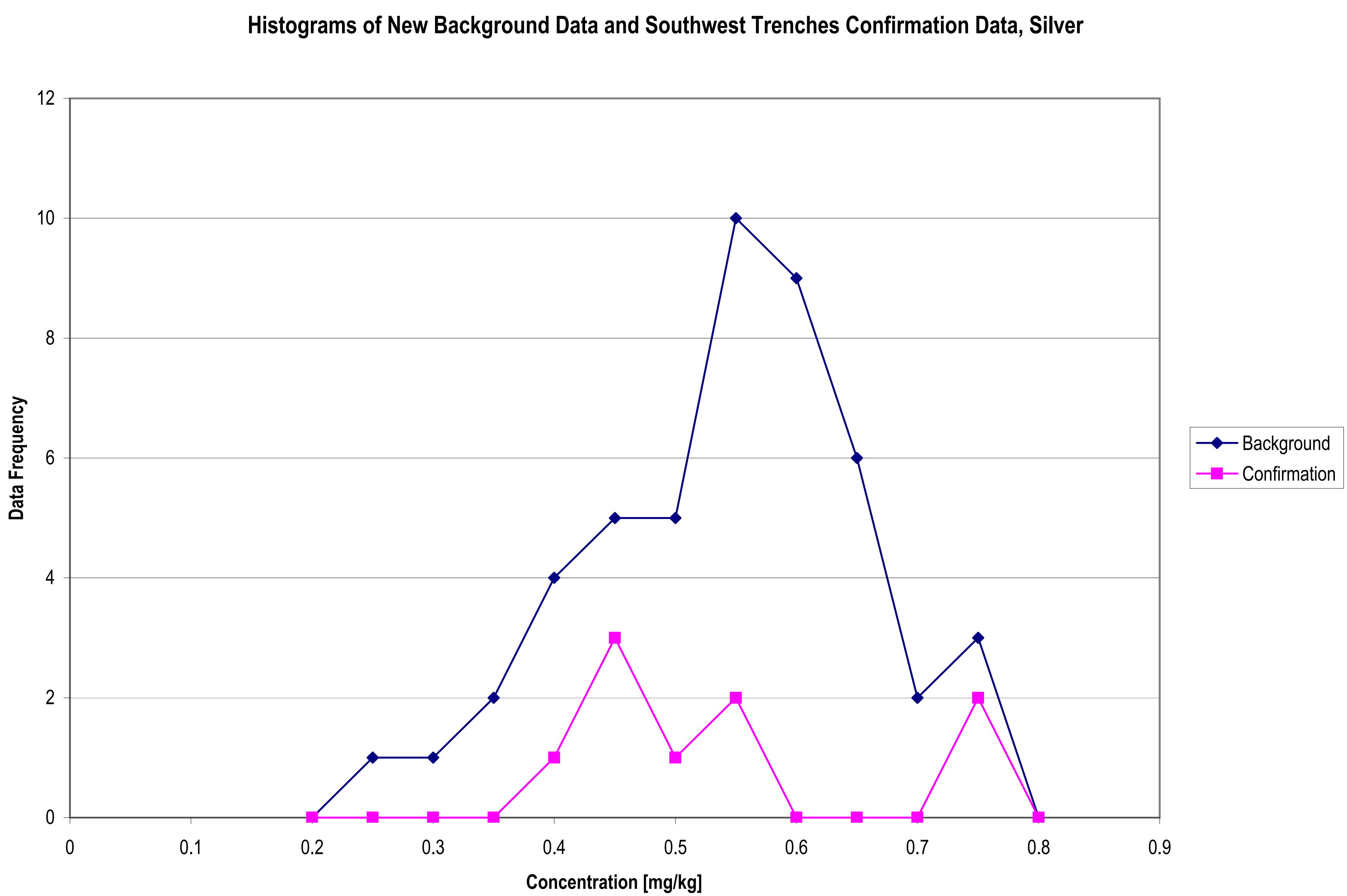
Histograms of Log Transformed of Background Data and Southwest Trenches Confirmation Data, Manganese



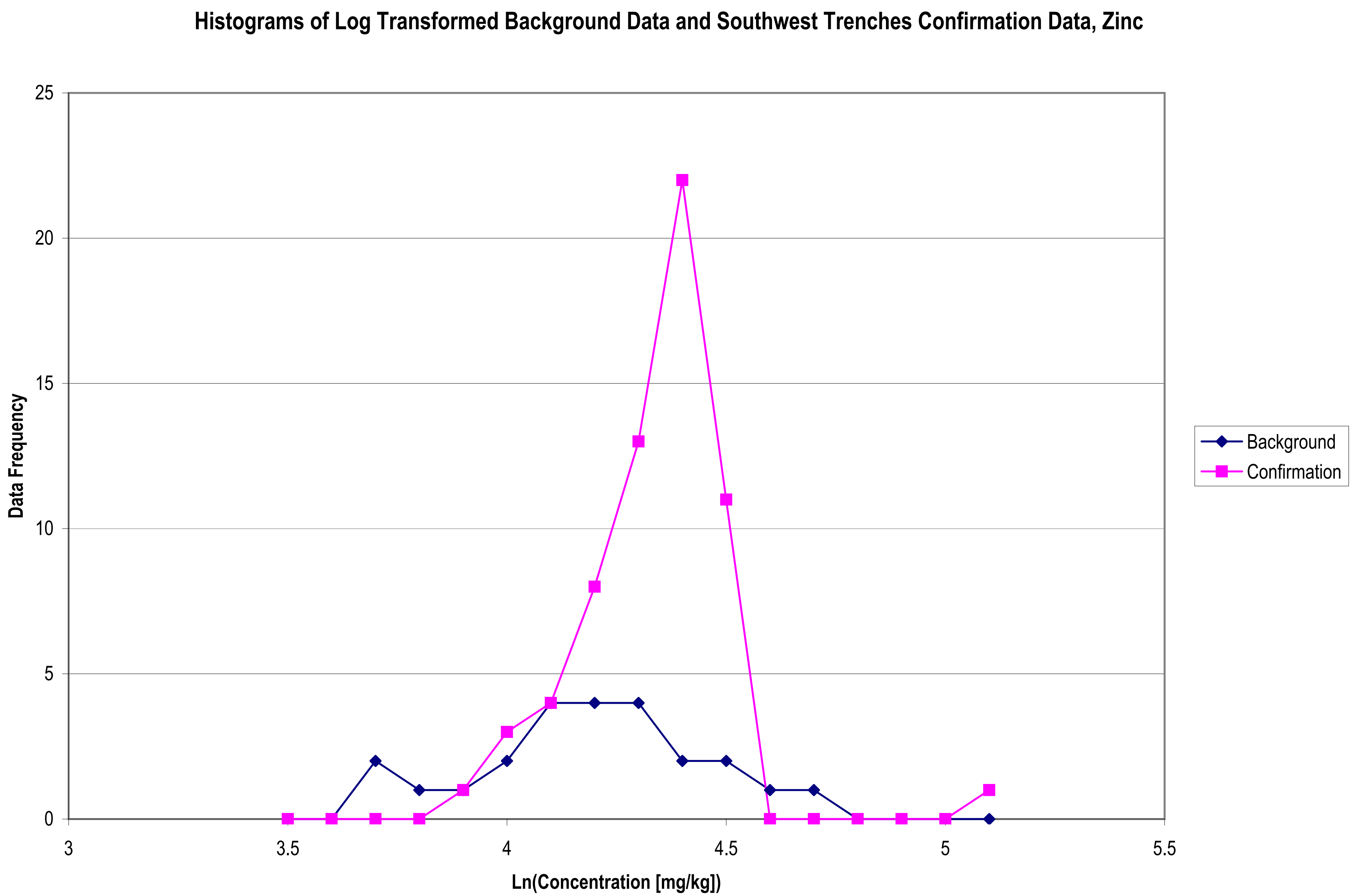


60
50
40
30
20
10
0
Data Frequency
0
1
2
3
4
5
6
7
Concentration [mg/kg]
Background
Confirmation

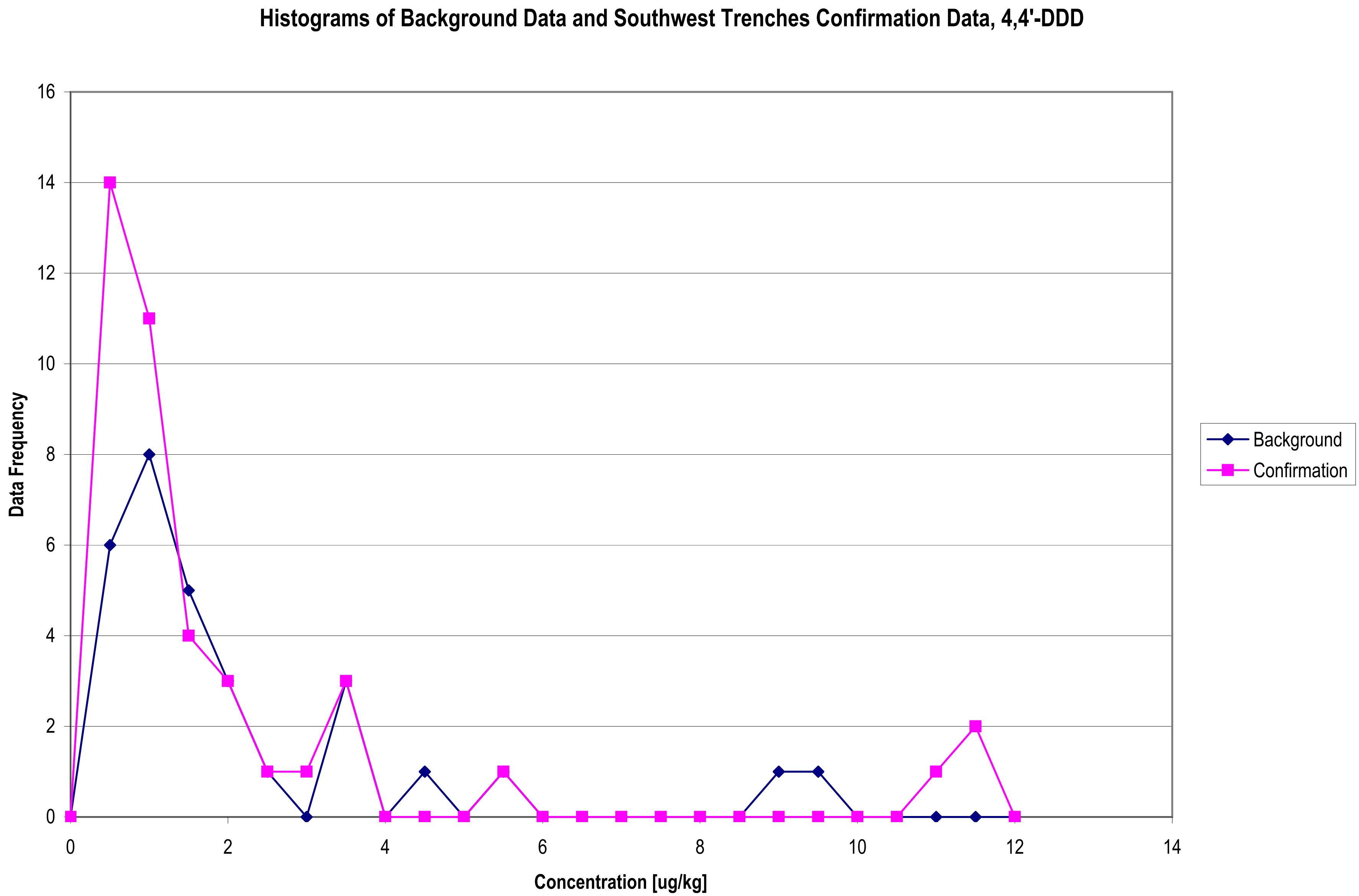
Histograms of Background Data and Southwest Trenches Confirmation Data, Selenium
Data Frequency
Concentration [mg/kg]
Background
Confirmation
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6



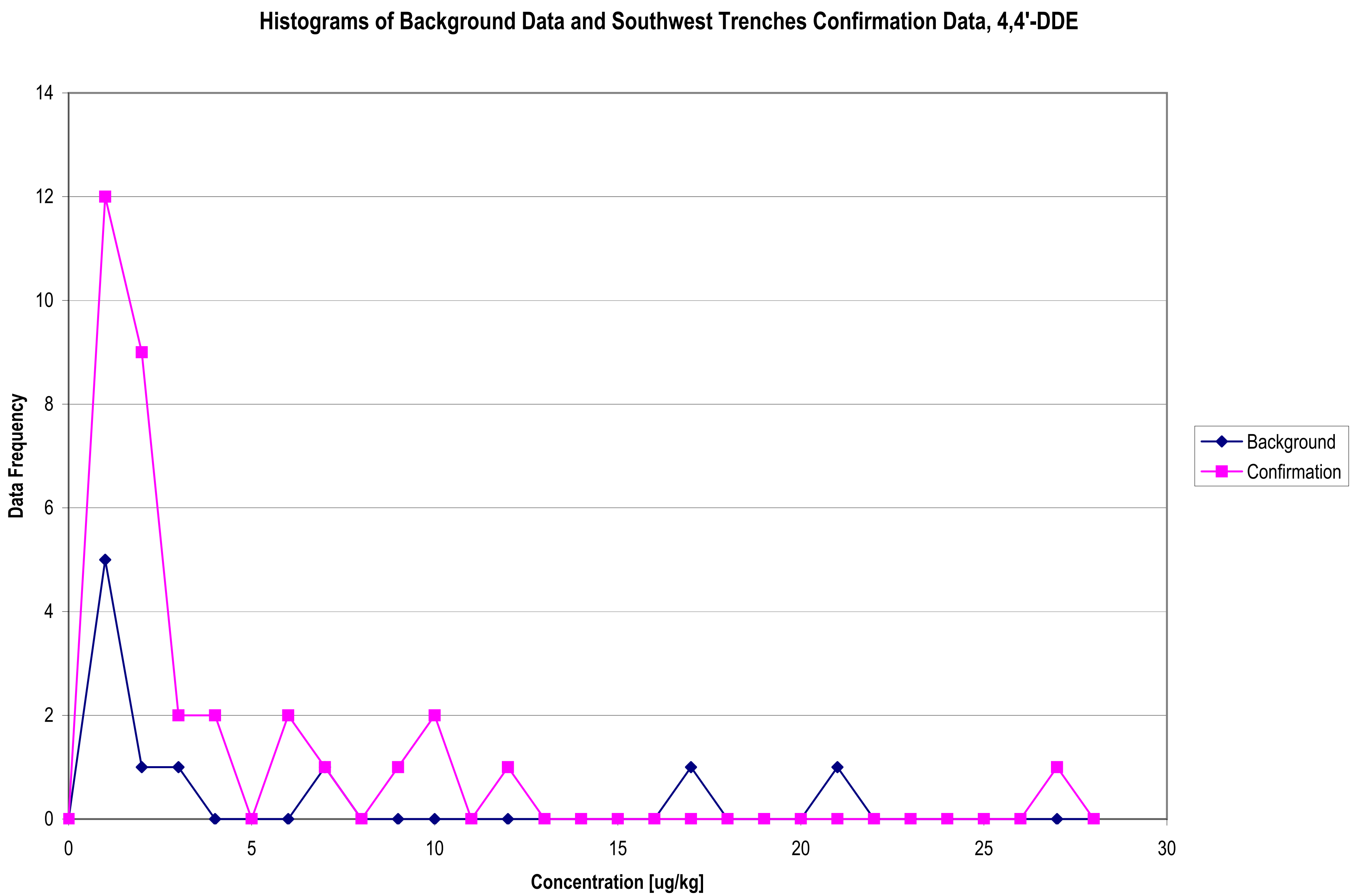
Histograms of New Background Data and Southwest Trenches Confirmation Data, Silver
Data Frequency
Concentration [mg/kg]
0
2
4
6
8
10
12
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Background
Confirmation

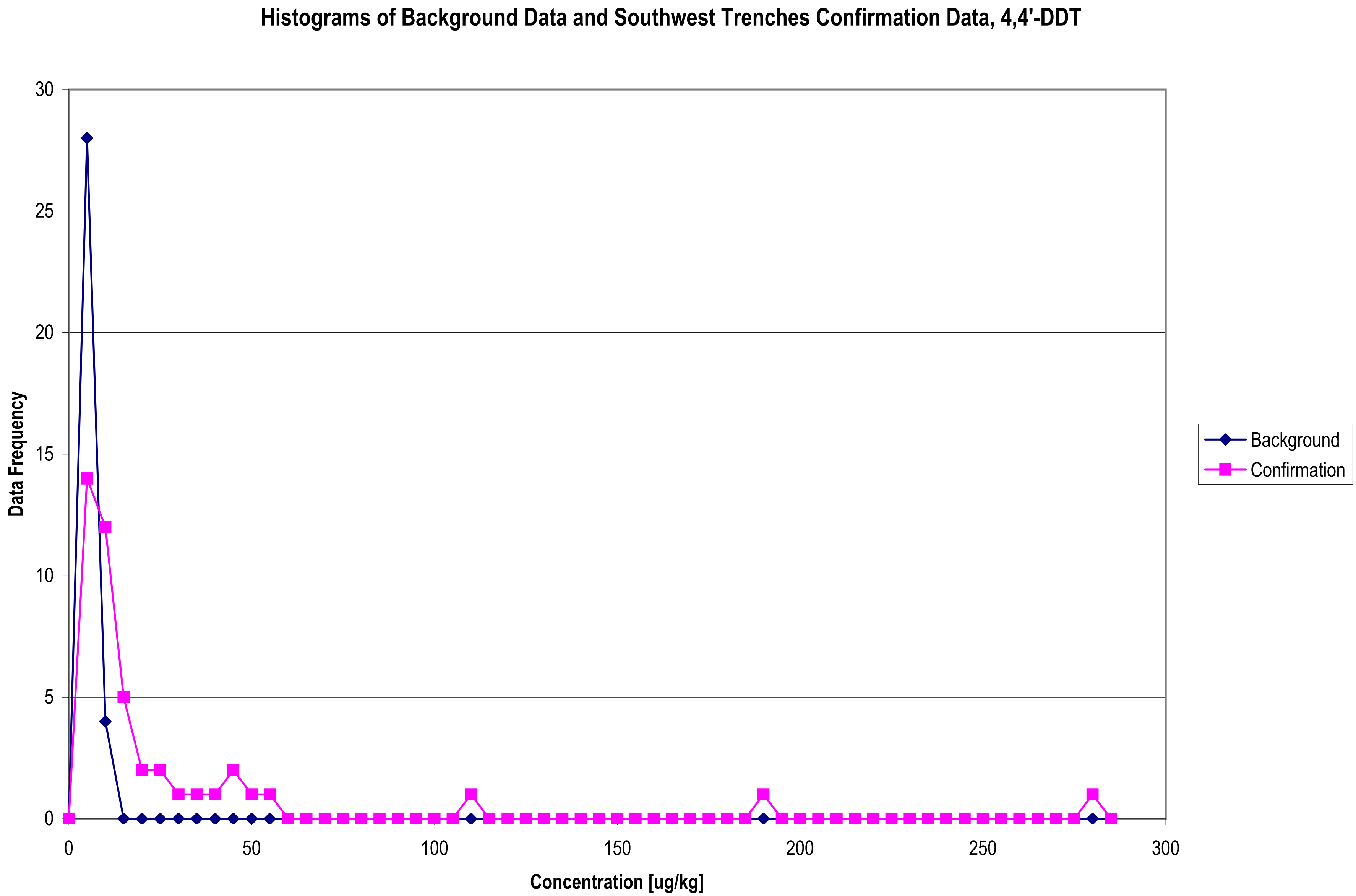


Histograms of Log Transformed Background Data and Southwest Trenches Confirmation Data, Zinc
Data Frequency
Ln(Concentration [mg/kg])
Background
Confirmation
0
5
10
15
20
25
3
3.5
4
4.5
5
5.5

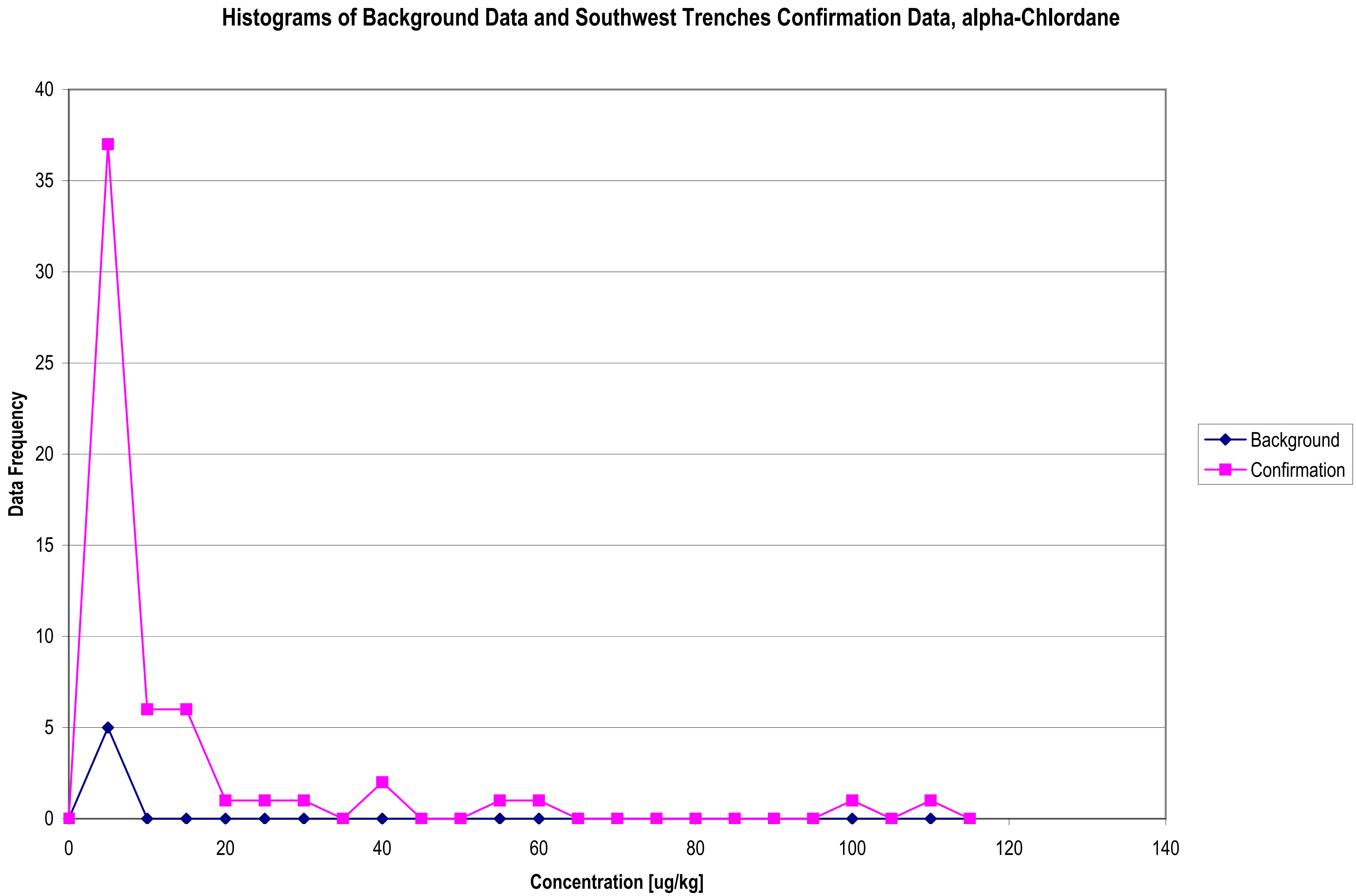


Histograms of Background Data and Southwest Trenches Confirmation Data, 4,4'-DDD
Data Frequency
Concentration [ug/kg]
Background
Confirmation
0
2
4
6
8
10
12
14
16

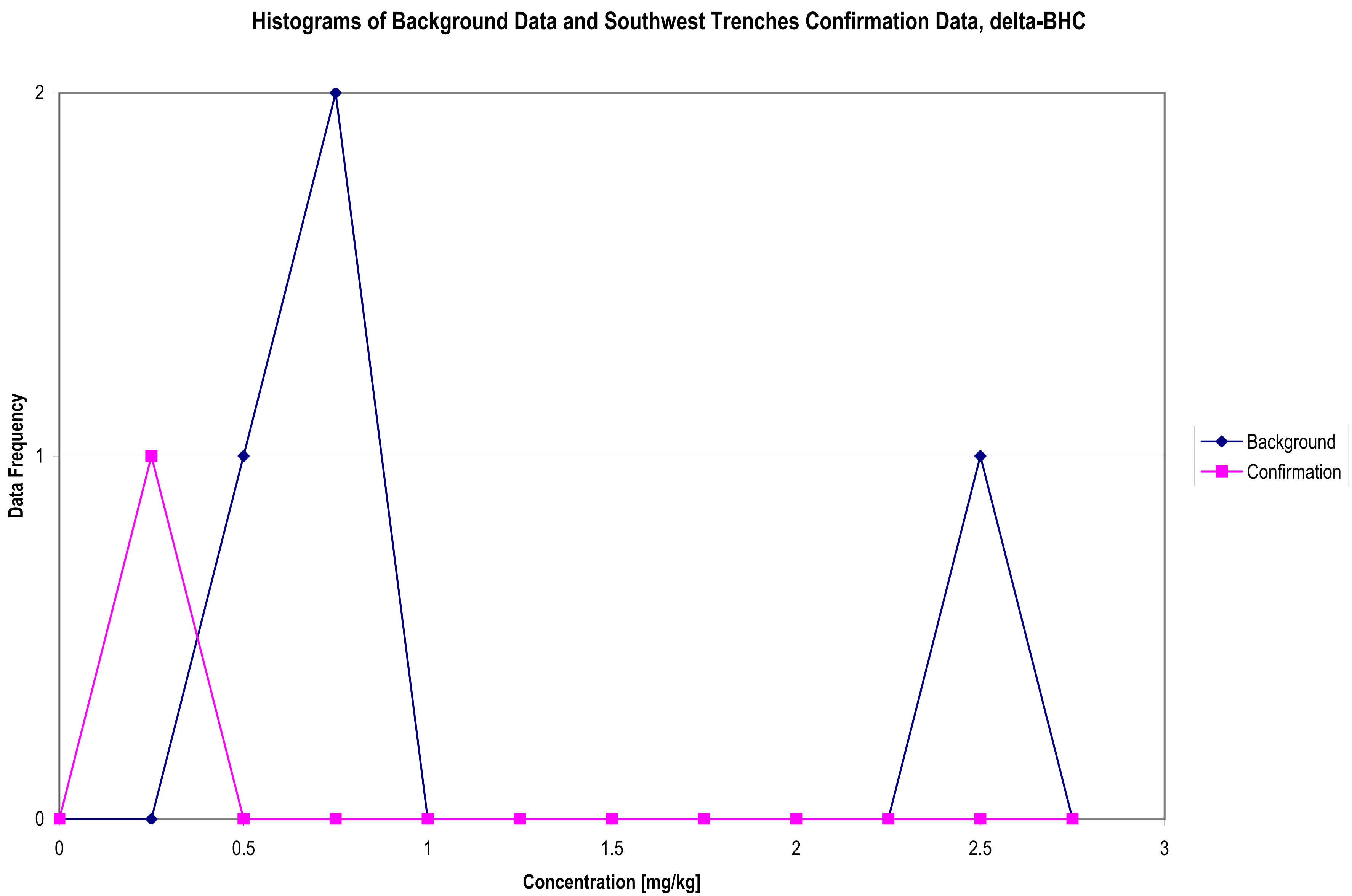

Histograms of Background Data and Southwest Trenches Confirmation Data, 4,4'-DDE
Data Frequency
0
2
4
6
8
10
12
14
Concentration [ug/kg]
0
5
10
15
20
25
30
Background
Confirmation



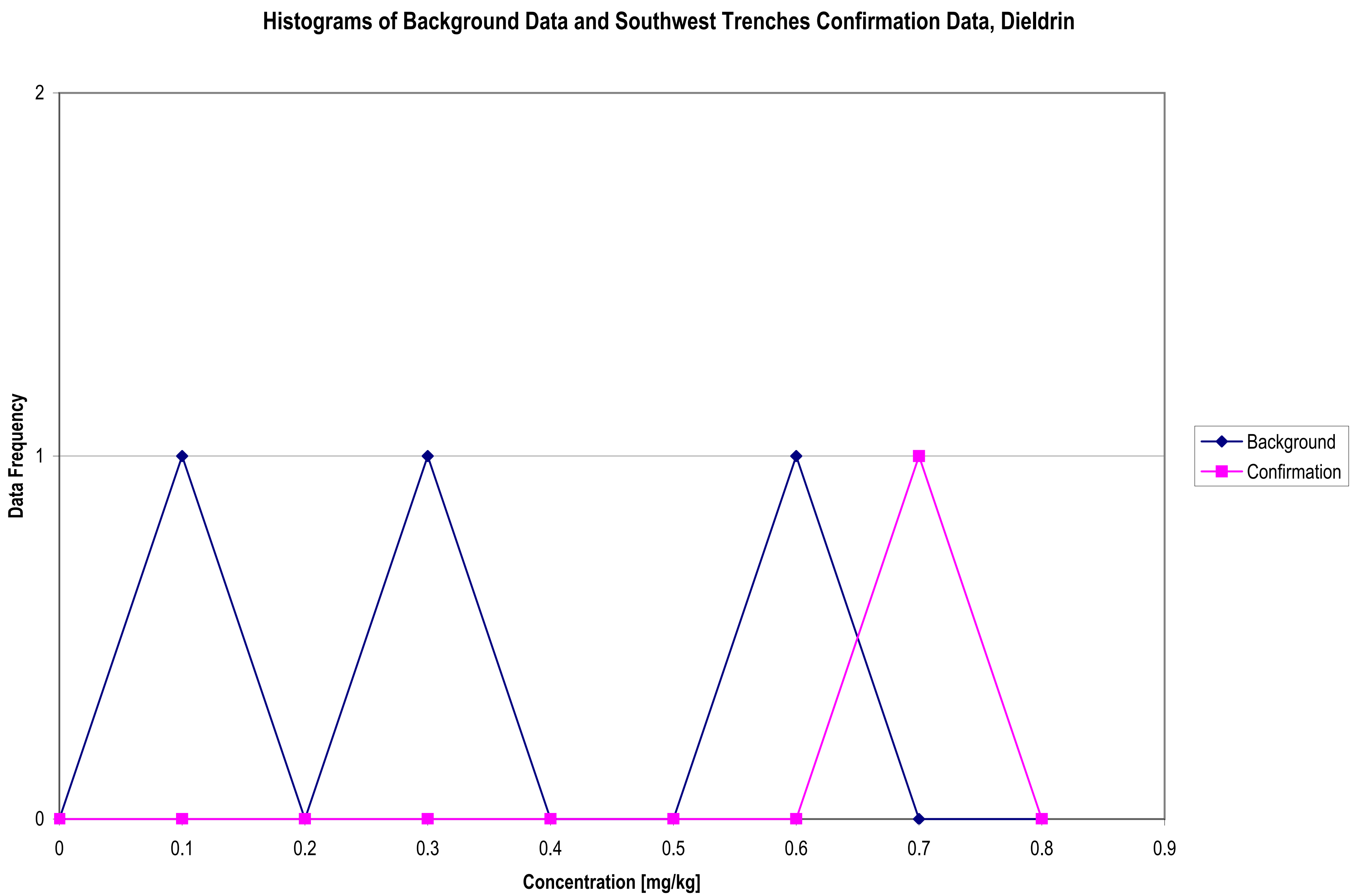
Histograms of Background Data and Southwest Trenches Confirmation Data, 4,4'-DDT
Data Frequency
Concentration [ug/kg]
0
5
10
15
20
25
30
0
50
100
150
200
250
300
Background
Confirmation

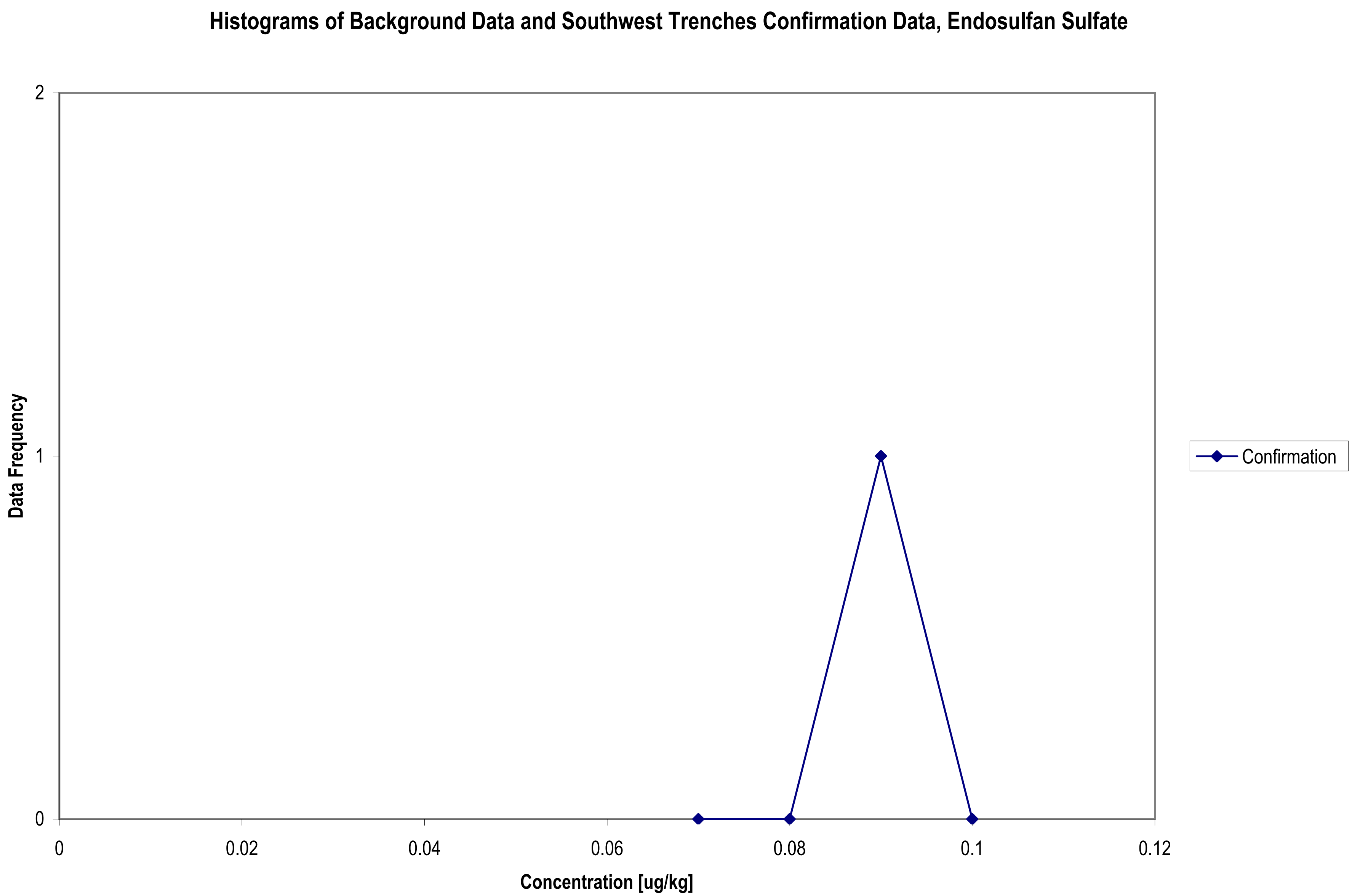


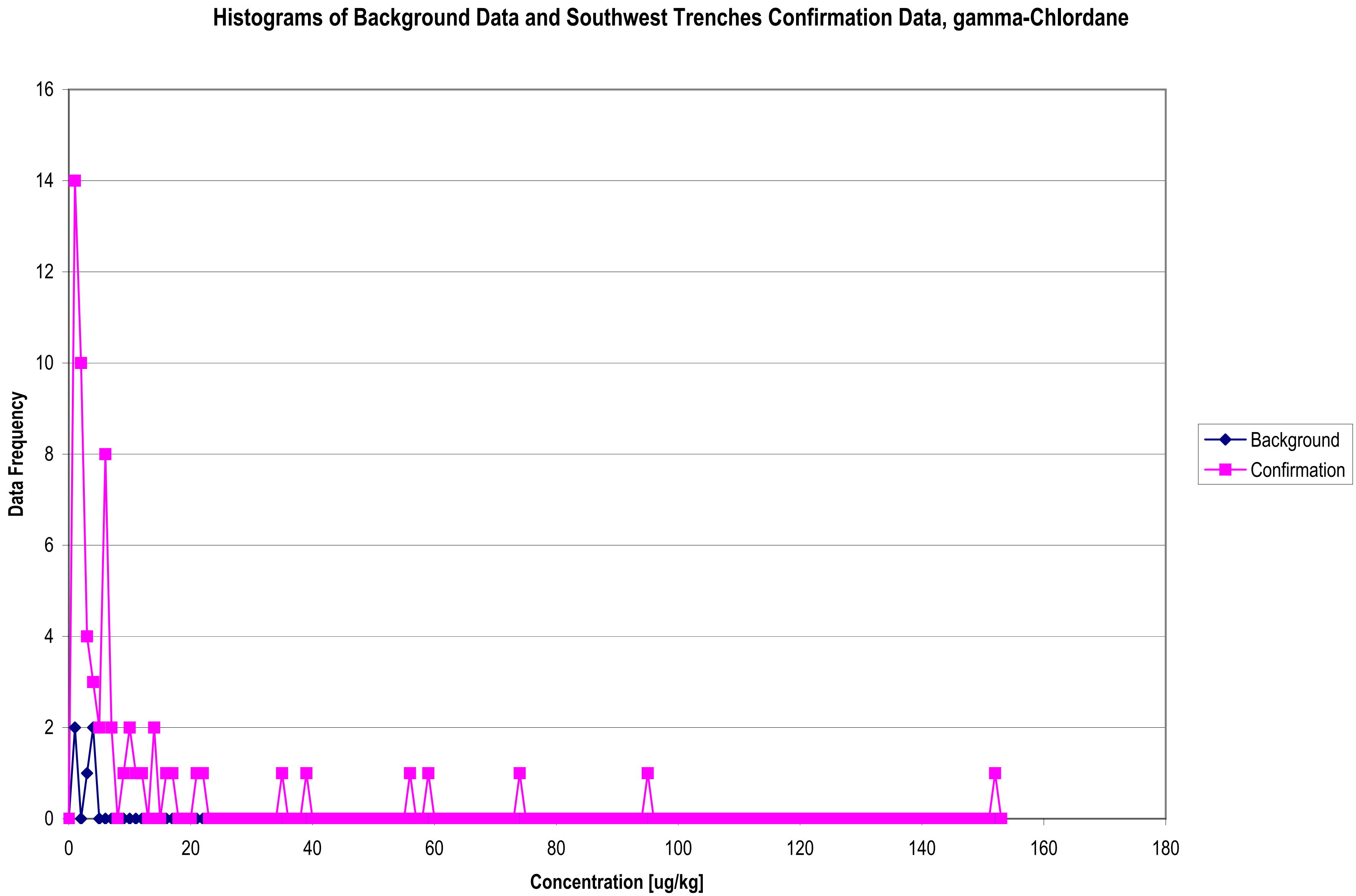
Histograms of Background Data and Southwest Trenches Confirmation Data, alpha-Chlordane
Data Frequency
0
5
10
15
20
25
30
35
40
0
20
40
60
80
100
120
140
Concentration [ug/kg]
Background
Confirmation



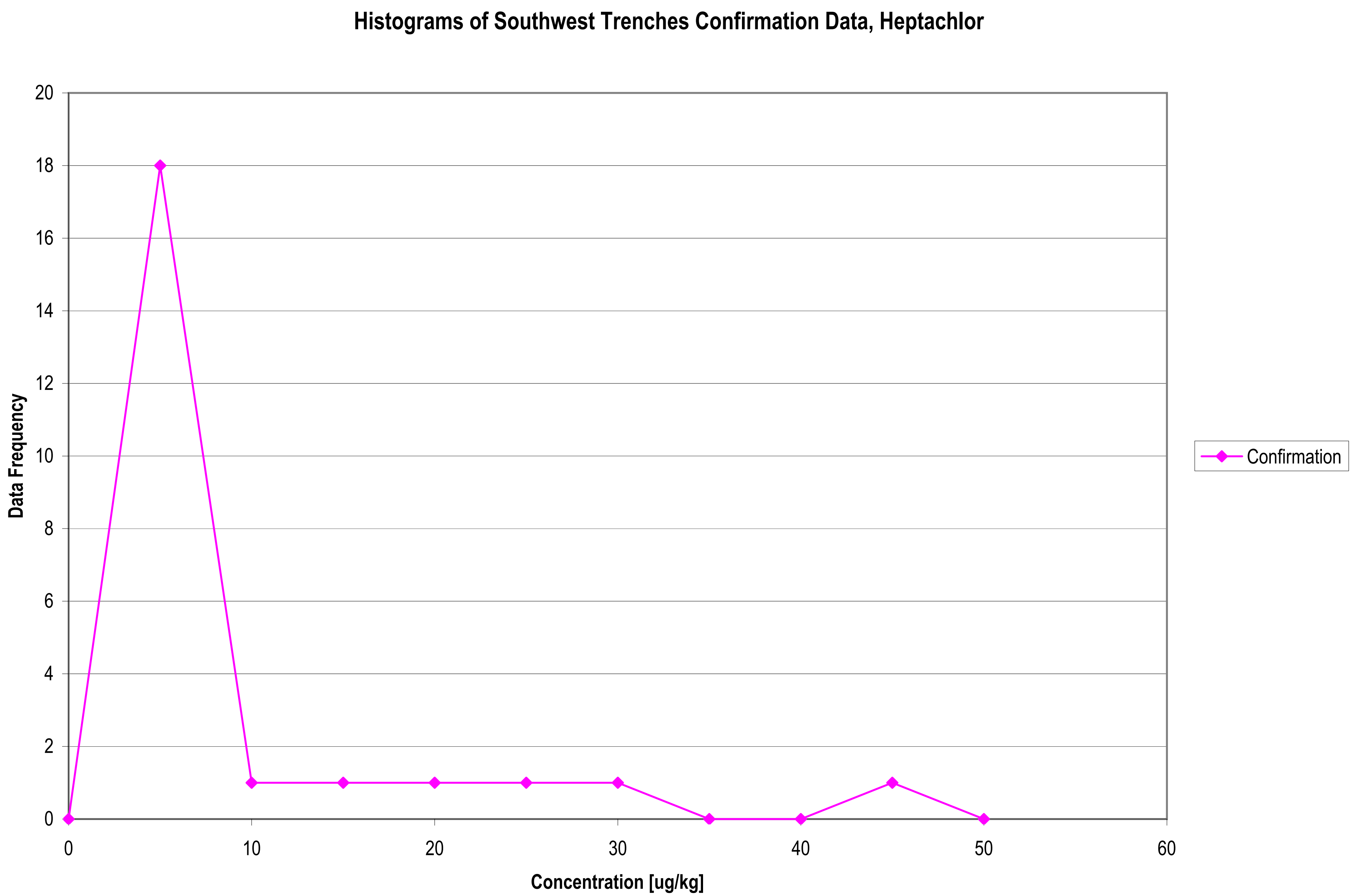
Histograms of Background Data and Southwest Trenches Confirmation Data, delta-BHC
Data Frequency
0
1
2
0
0.5
1
1.5
2
2.5
3
Concentration [mg/kg]
Background
Confirmation


Histograms of Background Data and Southwest Trenches Confirmation Data, Dieldrin
Data Frequency
2
1
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Concentration [mg/kg]
Background
Confirmation

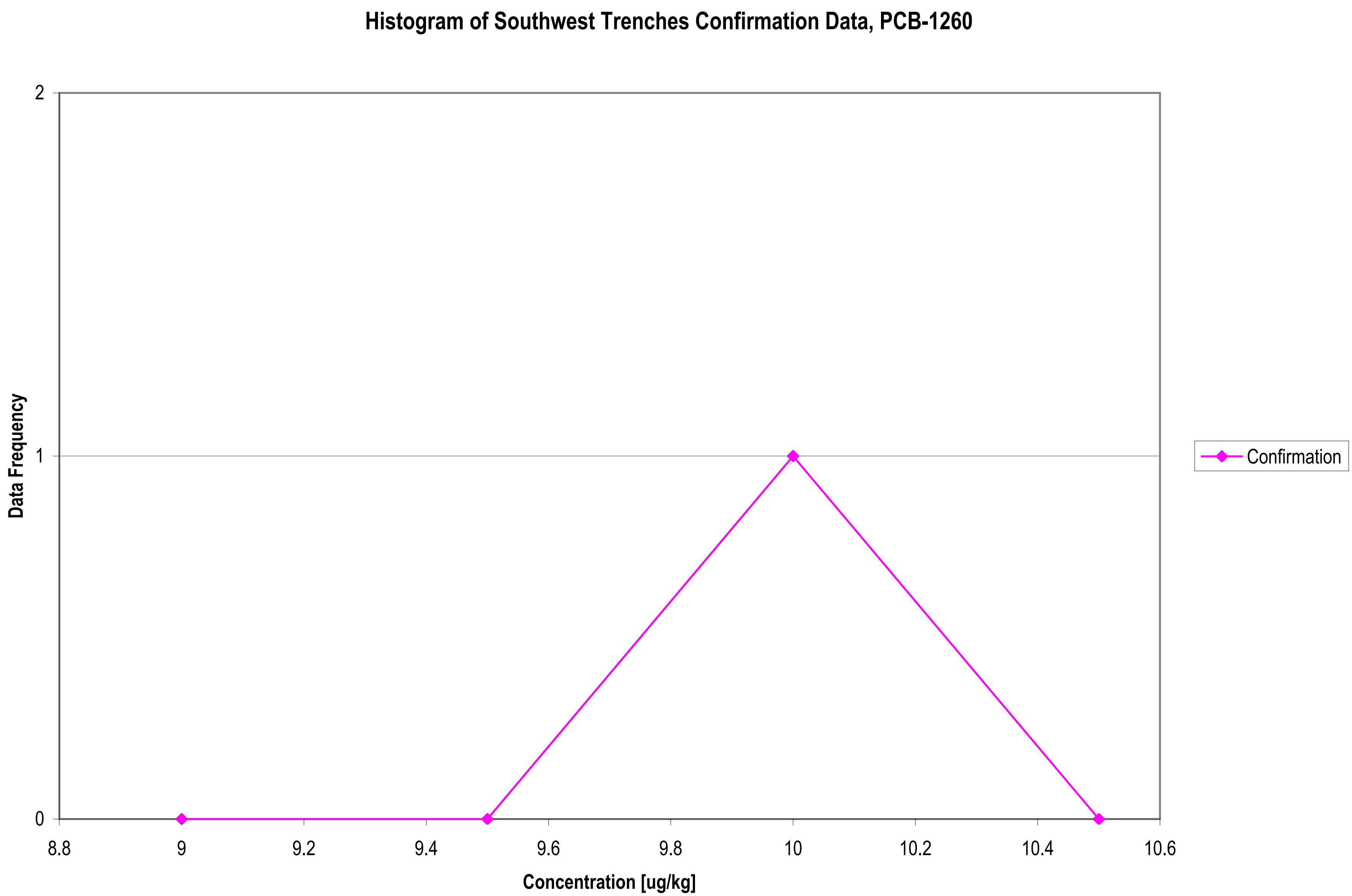

Histograms of Background Data and Southwest Trenches Confirmation Data, Endosulfan Sulfate
Data Frequency
2
1
0
0
0.02
0.04
0.06
0.08
0.1
0.12
Concentration [ug/kg]
Confirmation

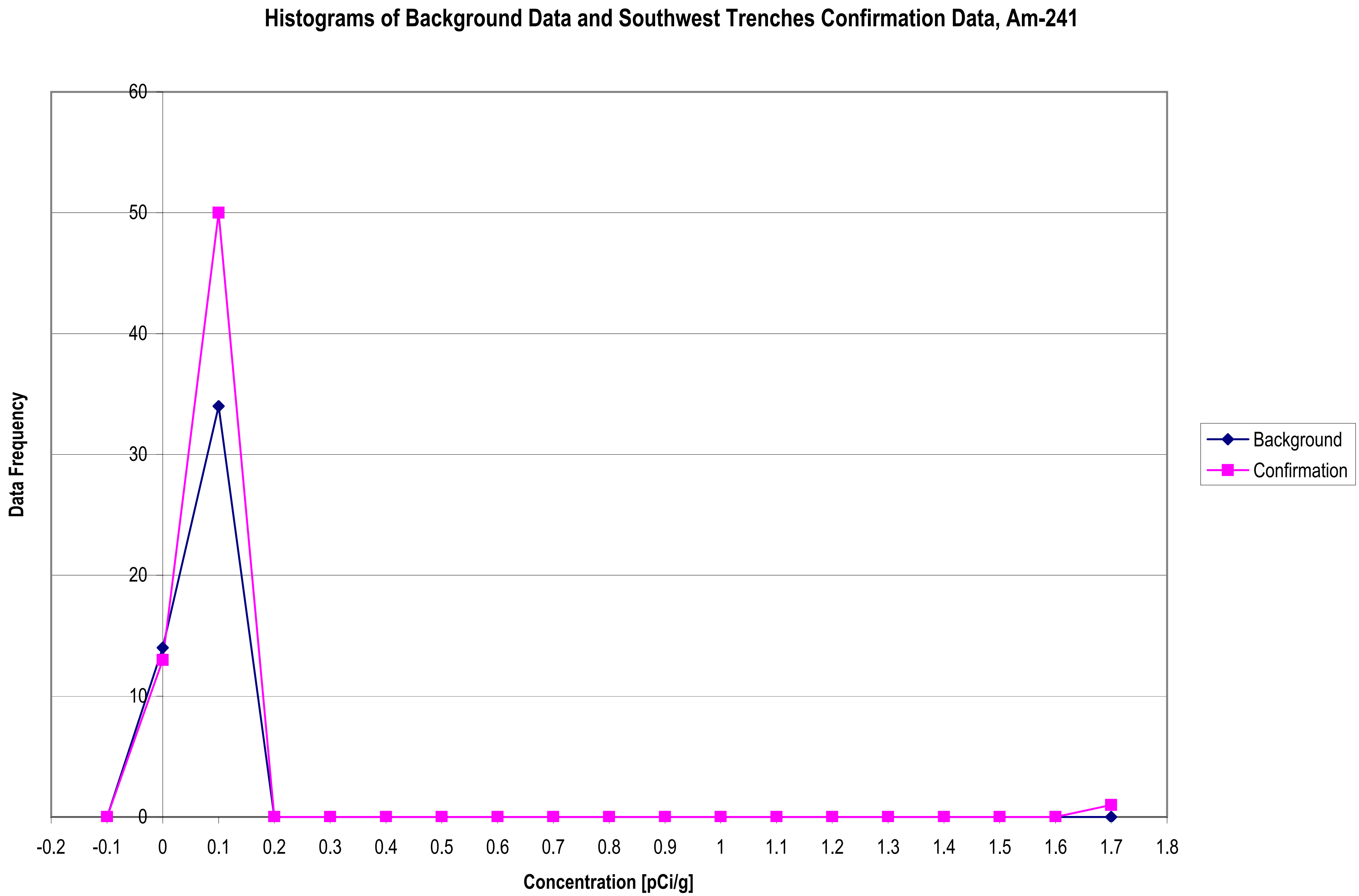


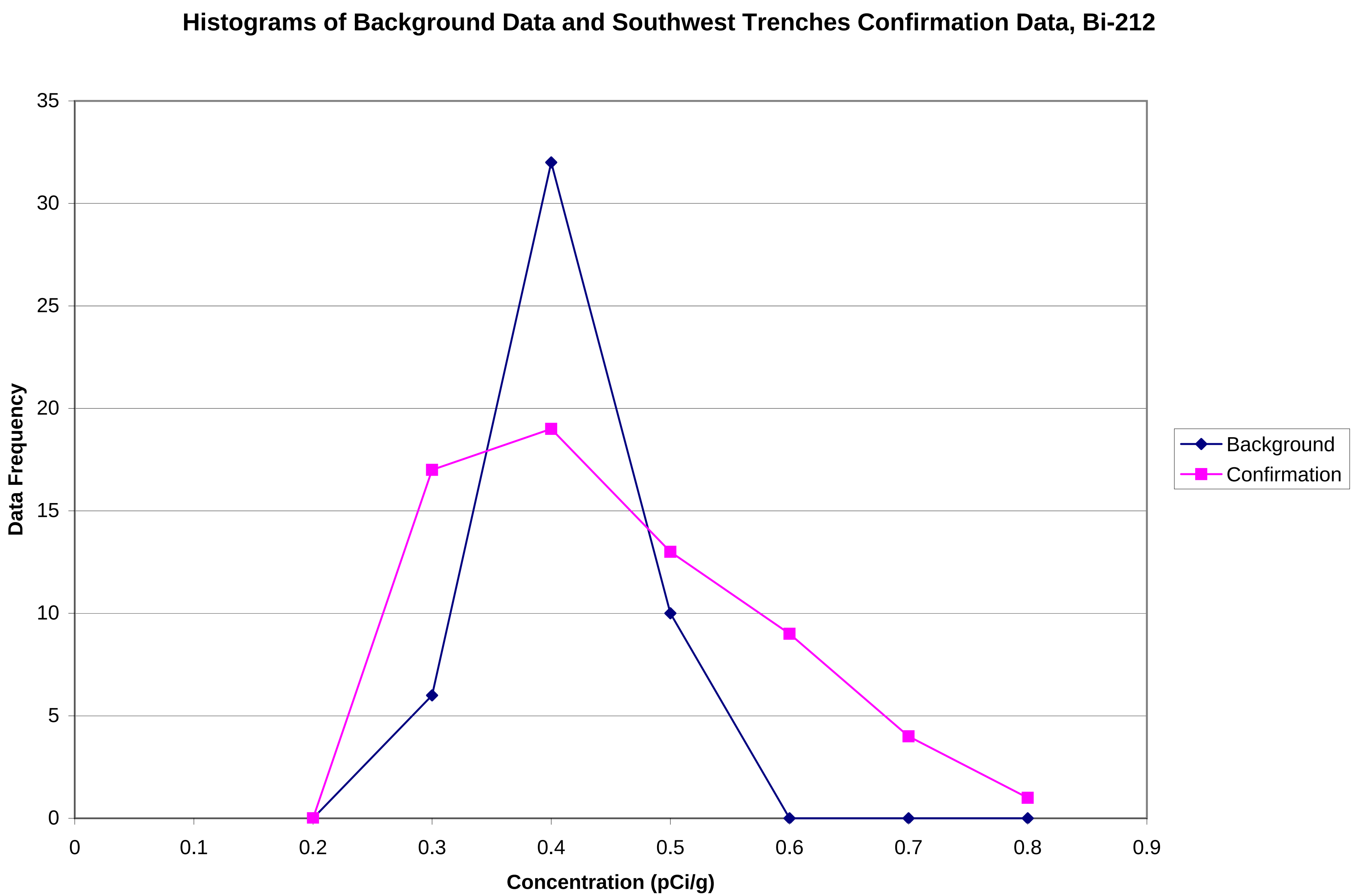
Histograms of Background Data and Southwest Trenches Confirmation Data, gamma-Chlordane
Data Frequency
Concentration [ug/kg]
0
2
4
6
8
10
12
14
16
0
20
40
60
80
100
120
140
160
180
Background
Confirmation

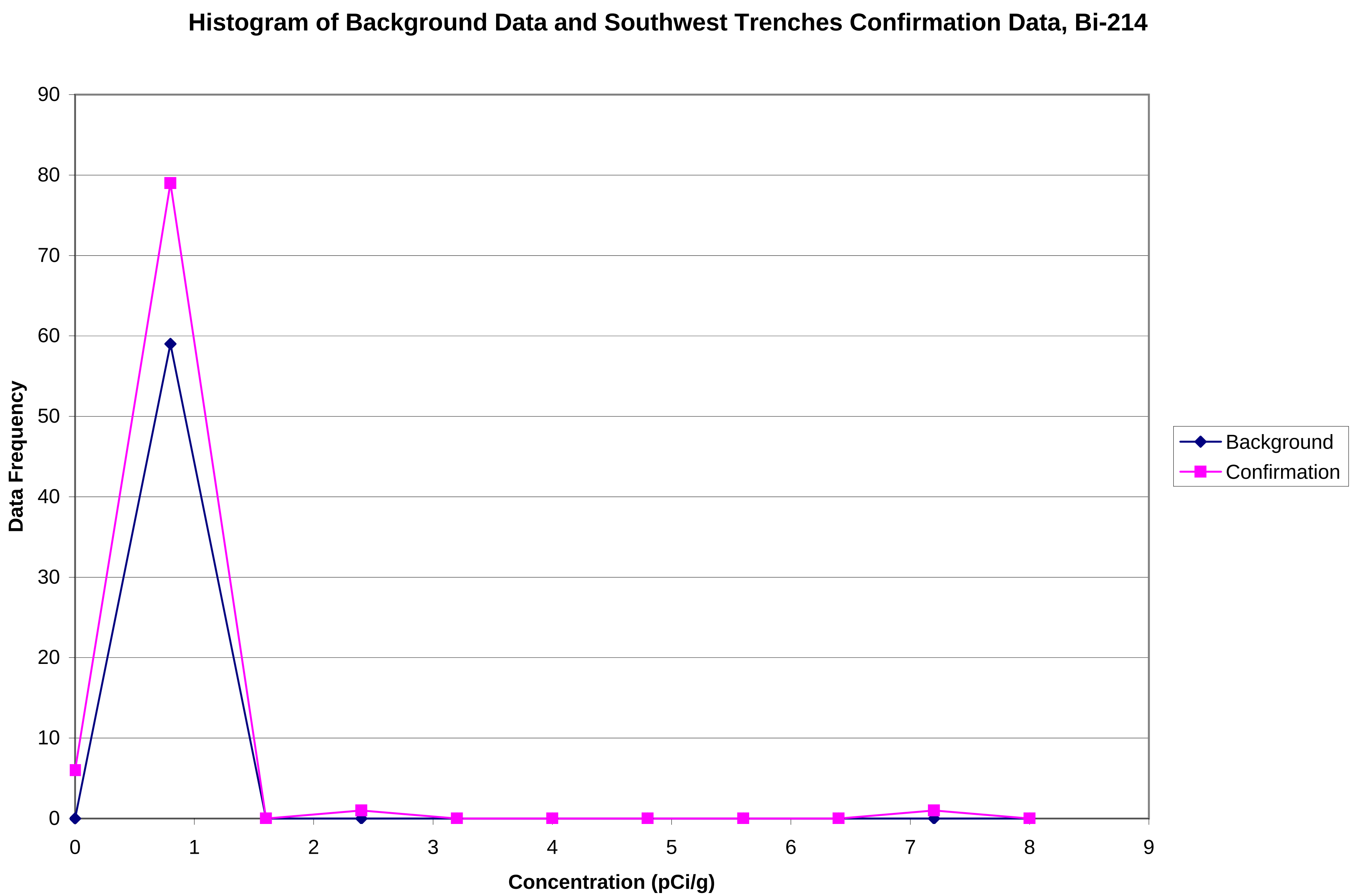


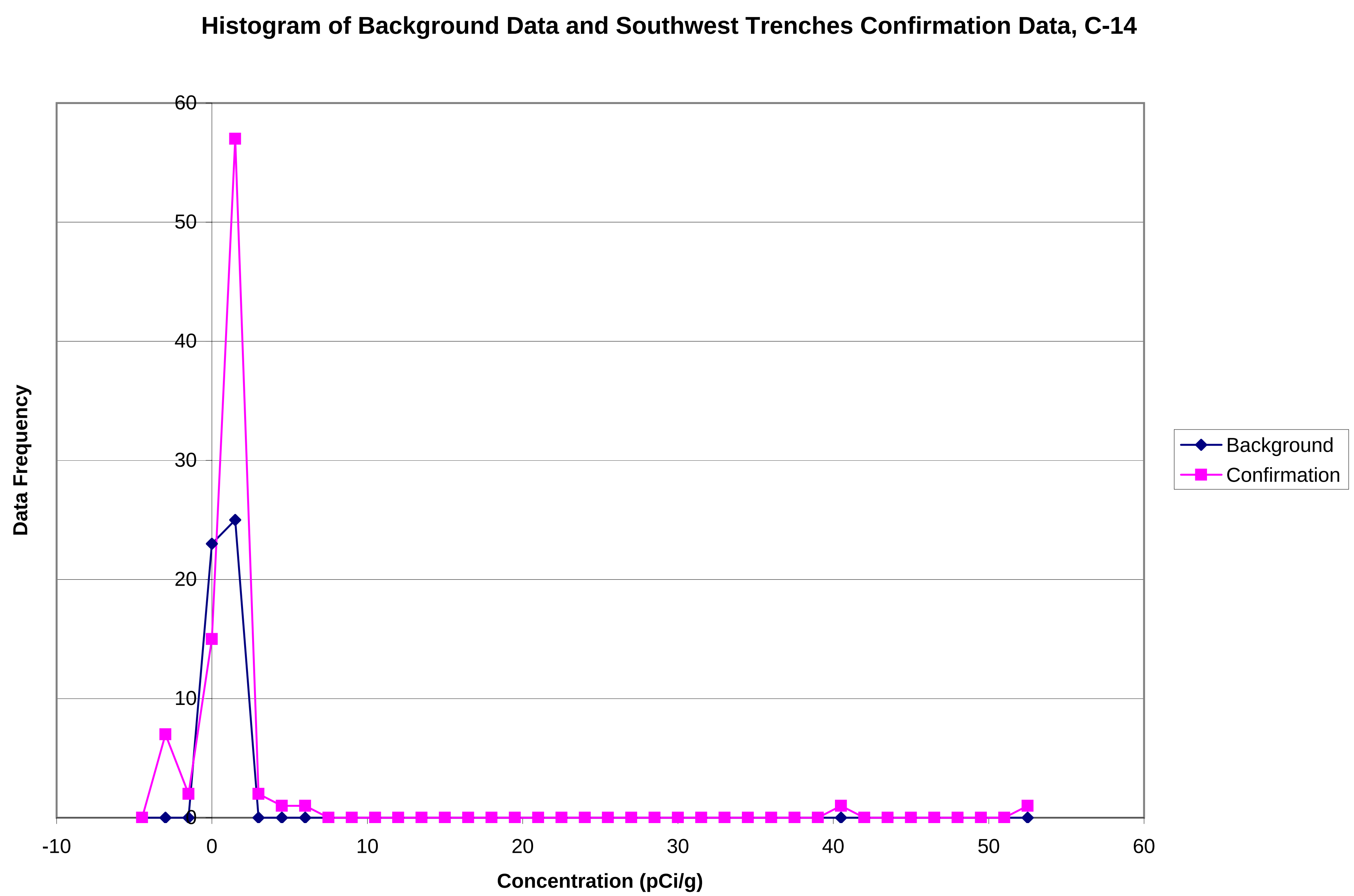
Histograms of Southwest Trenches Confirmation Data, Heptachlor
Data Frequency
Concentration [ug/kg]
Confirmation
0
2
4
6
8
10
12
14
16
18
20
0
10
20
30
40
50
60


Histogram of Southwest Trenches Confirmation Data, PCB-1260
Data Frequency
2
1
0
8.8
9
9.2
9.4
9.6
9.8
10
10.2
10.4
10.6
Concentration [ug/kg]
Confirmation

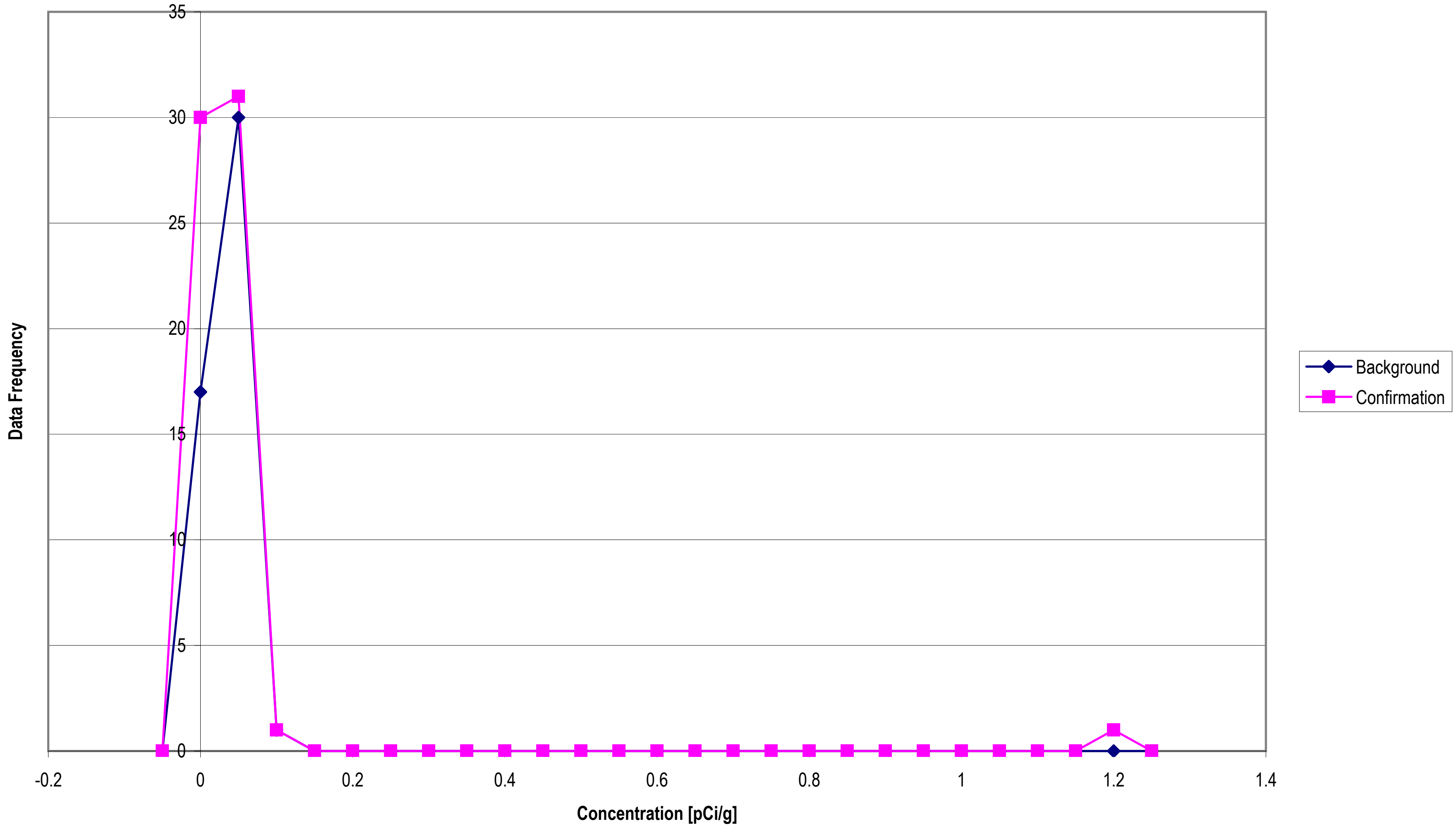

Histograms of Background Data and Southwest Trenches Confirmation Data, Am-241
Data Frequency
60
50
40
30
20
10
0
-0.2
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
Concentration [pCi/g]
Background
Confirmation


Histograms of Background Data and Southwest Trenches Confirmation Data, Bi-212
Data Frequency
Concentration (pCi/g)
0
5
10
15
20
25
30
35
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Background
Confirmation

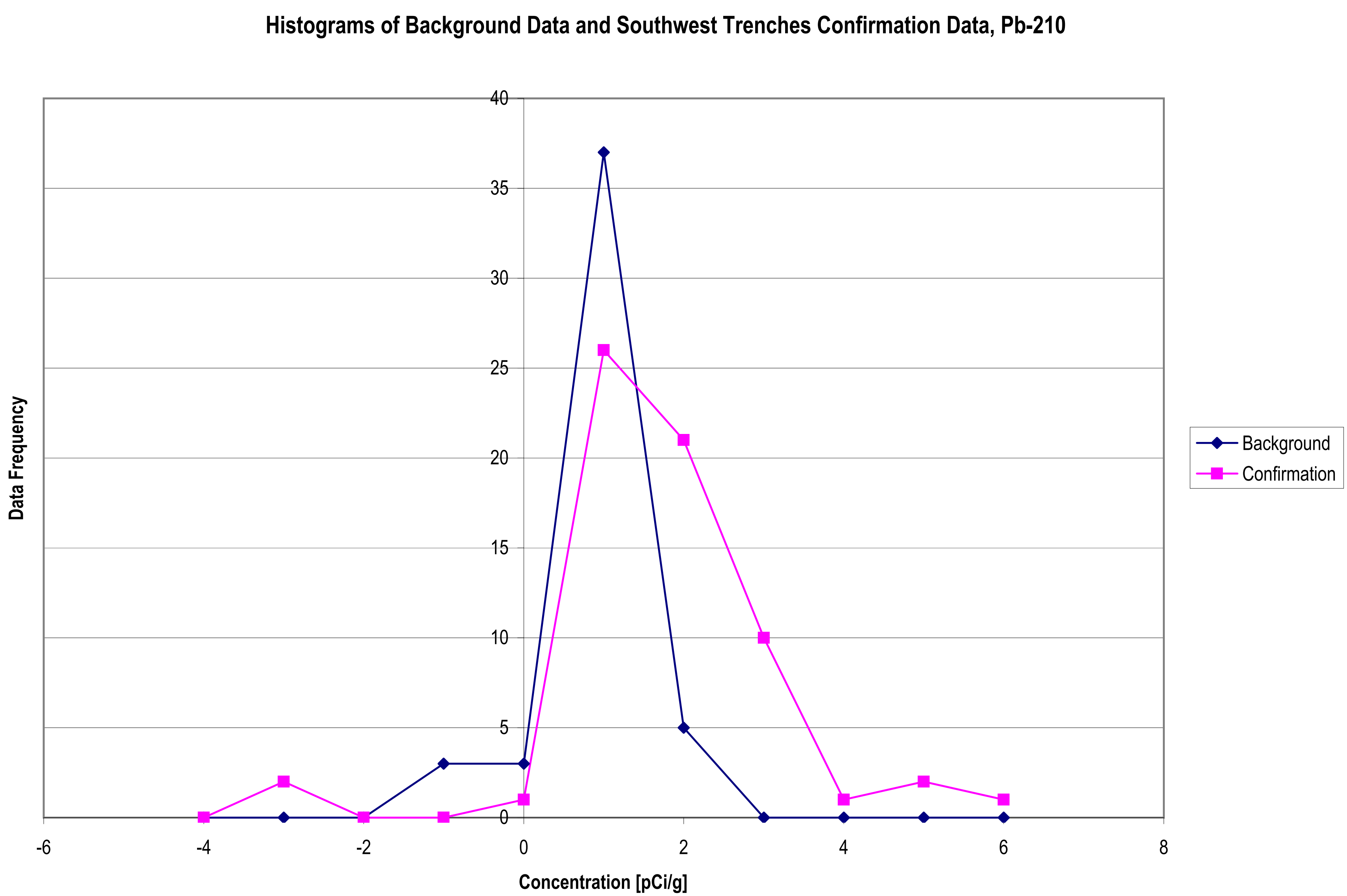

Histogram of Background Data and Southwest Trenches Confirmation Data, Bi-214
Data Frequency
90
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
6
7
8
9
Concentration (pCi/g)
Background
Confirmation

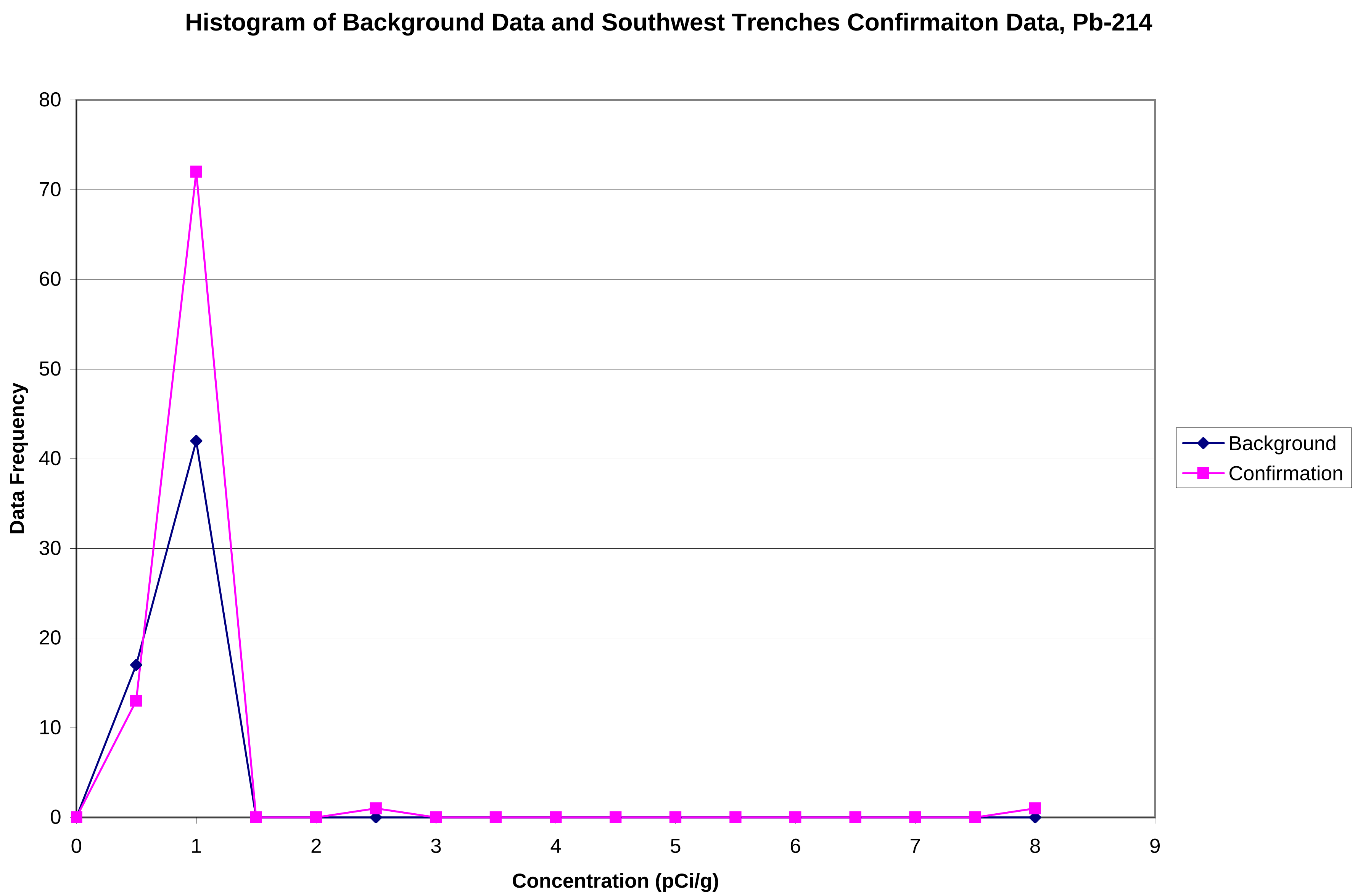


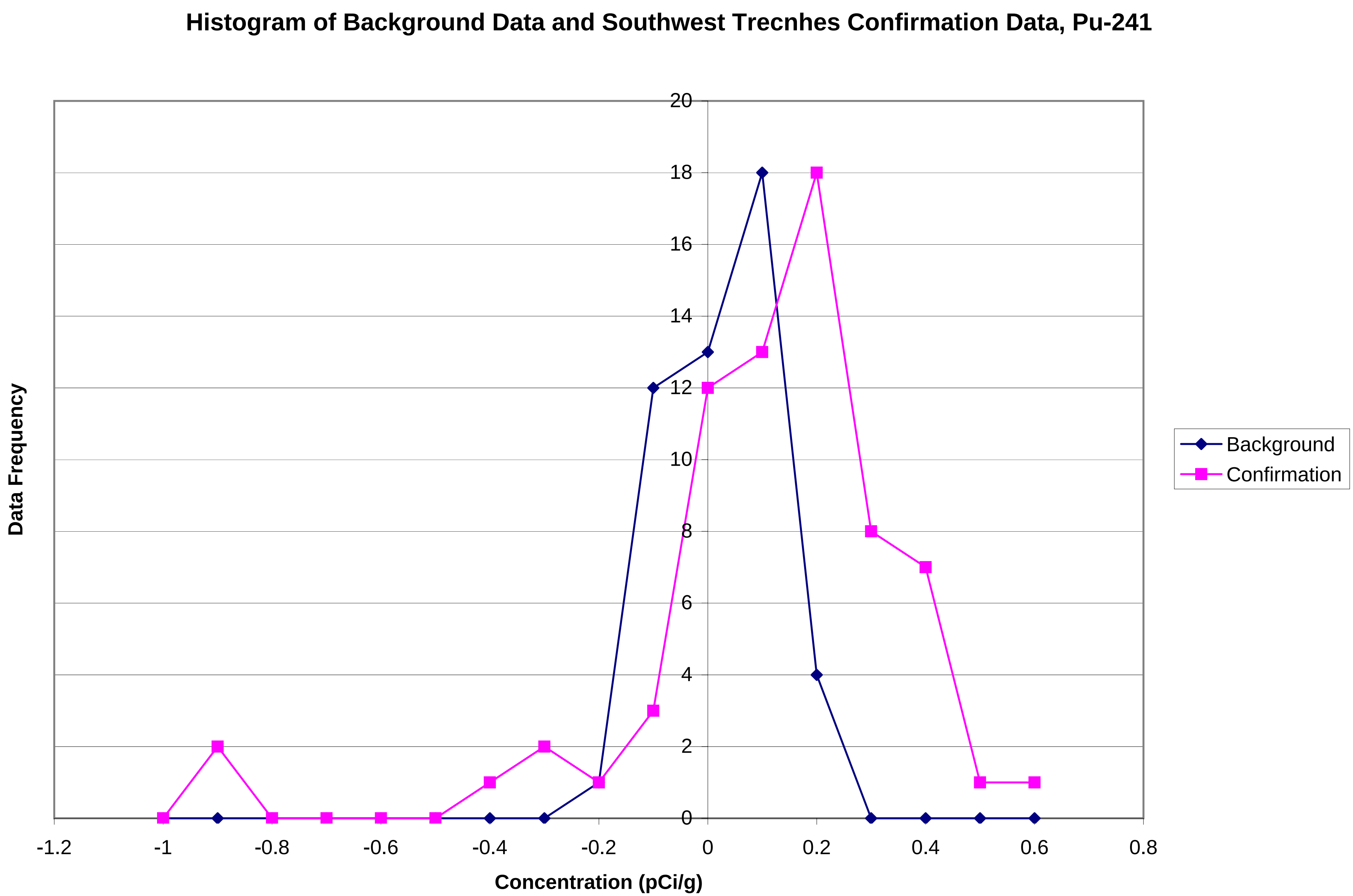
Histogram of Background Data and Southwest Trenches Confirmation Data, C-14
Data Frequency
Concentration (pCi/g)
60
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Background
Confirmation



Data Frequency
Concentration [pCi/g]
Background
Confirmation
35
30
25
20
15
10
5
0
-0.2
0
0.2
0.4
0.6
0.8
1
1.2
1.4

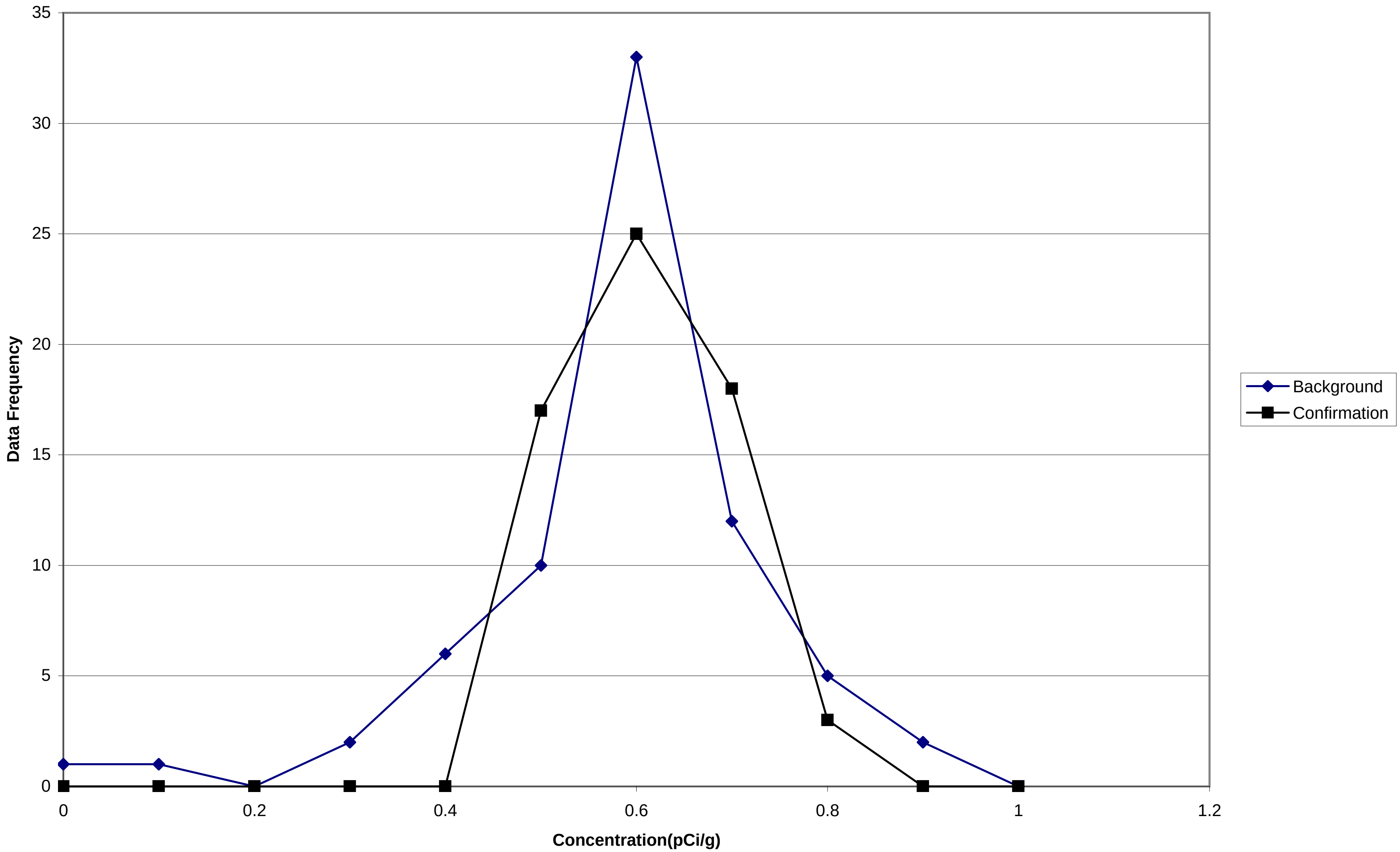

Histograms of Background Data and Southwest Trenches Confirmation Data, Pb-210
Data Frequency
Concentration [pCi/g]
Background
Confirmation
0
5
10
15
20
25
30
35
40
-6
-4
-2
0
2
4
6
8


Histogram of Background Data and Southwest Trenches Confirmaiton Data, Pb-214
Data Frequency
Concentration (pCi/g)
0
10
20
30
40
50
60
70
80
0
1
2
3
4
5
6
7
8
9
Background
Confirmation

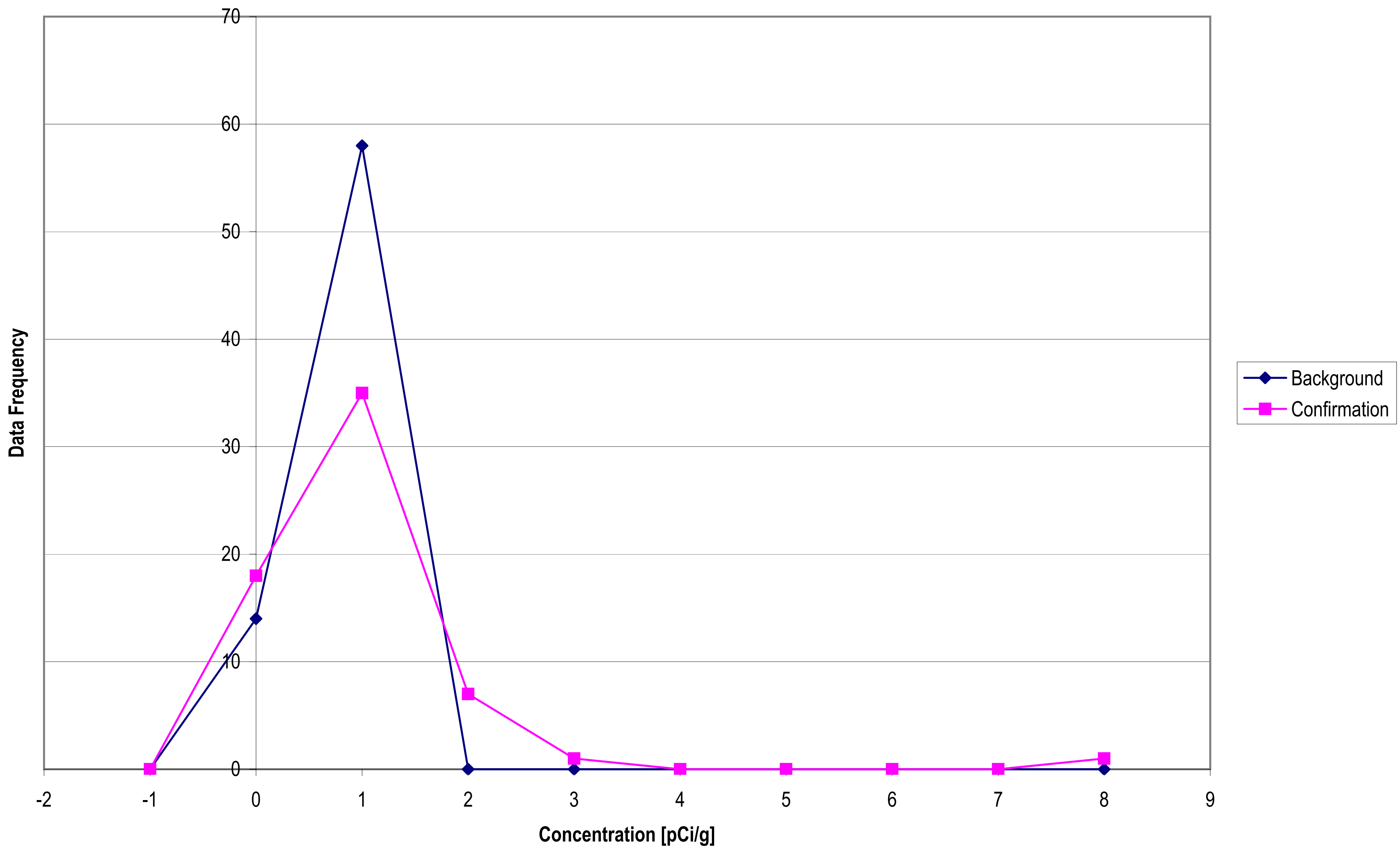


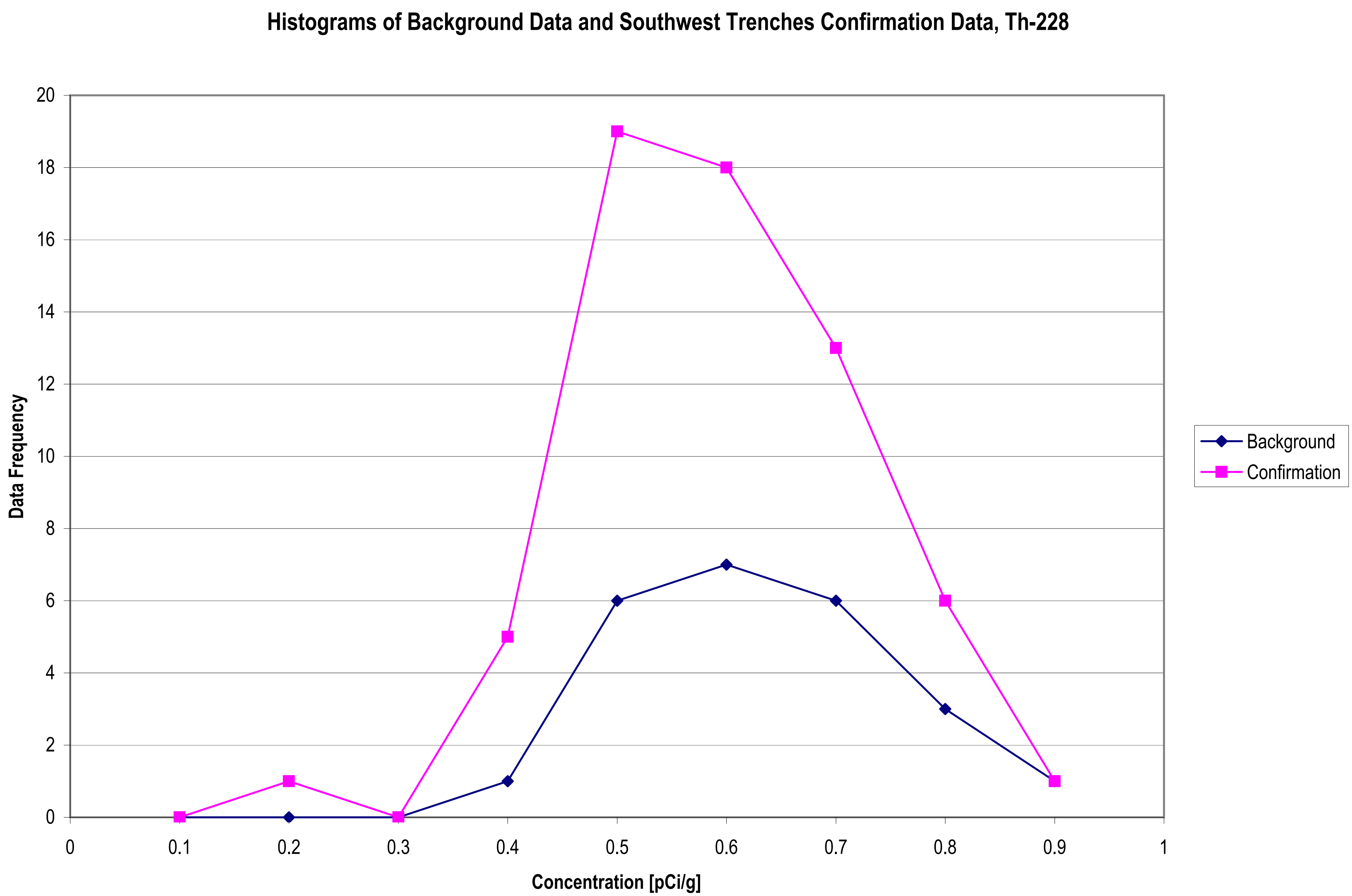
Histogram of Background Data and Southwest Trecnhes Confirmation Data, Pu-241
Data Frequency
Concentration (pCi/g)
Background
Confirmation
20
18
16
14
12
10
8
6
4
2
0
-1.2
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8

Histogram of Background Data and Southwest Trenches Confirmation Data, Radium-226

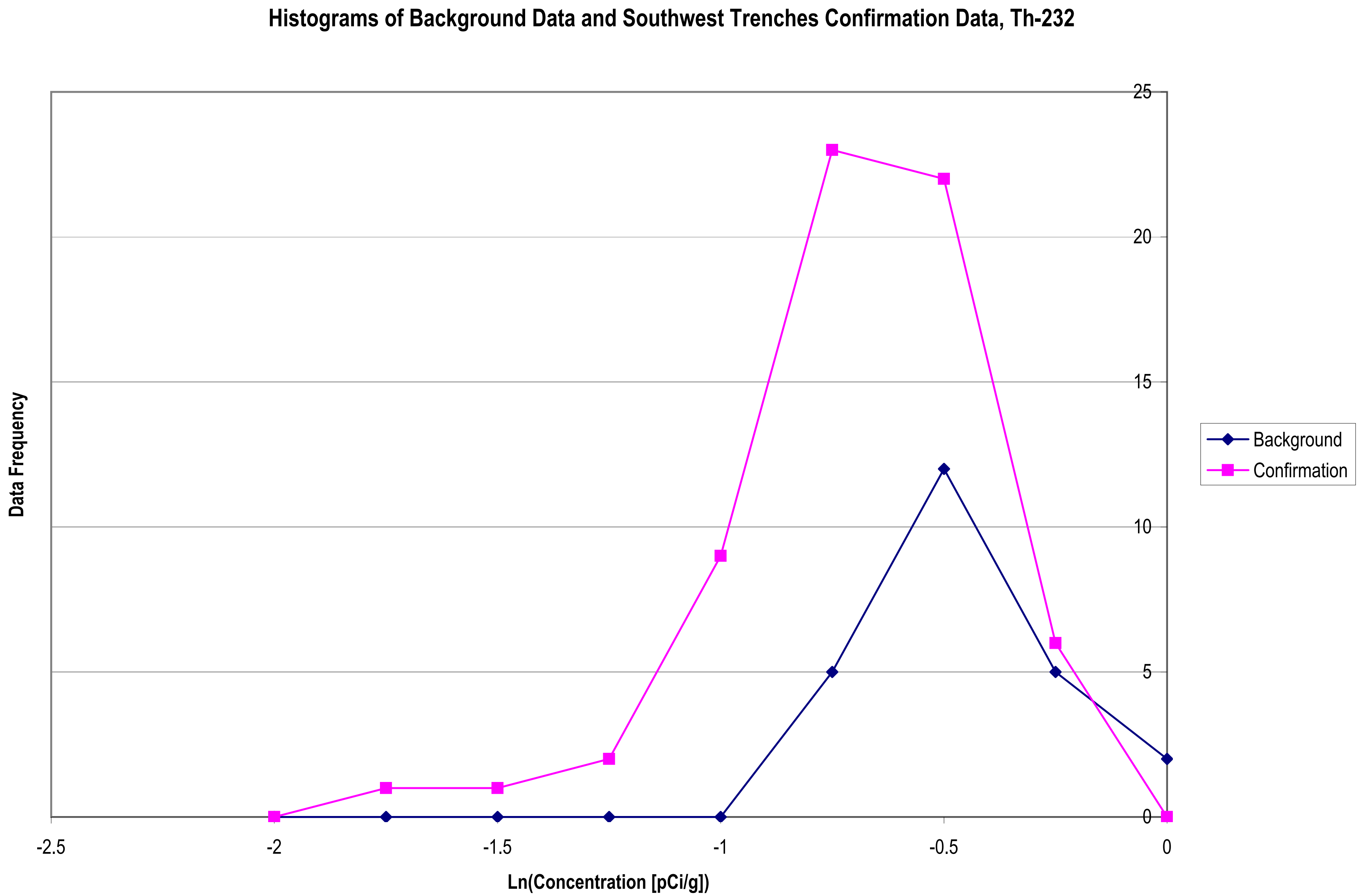


Histograms of Background Data and Southwest Trenches Confirmation Data, Sr-90

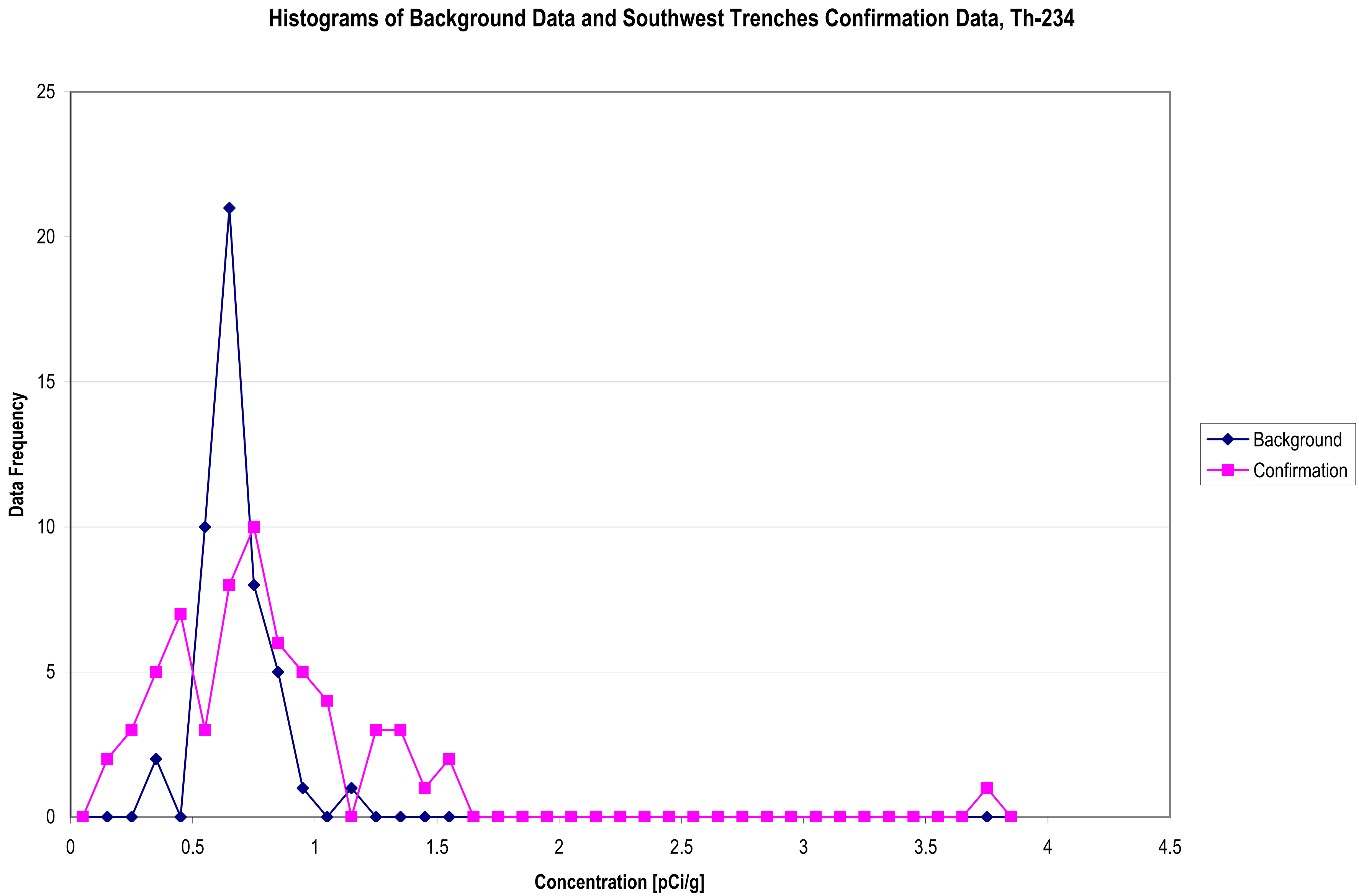


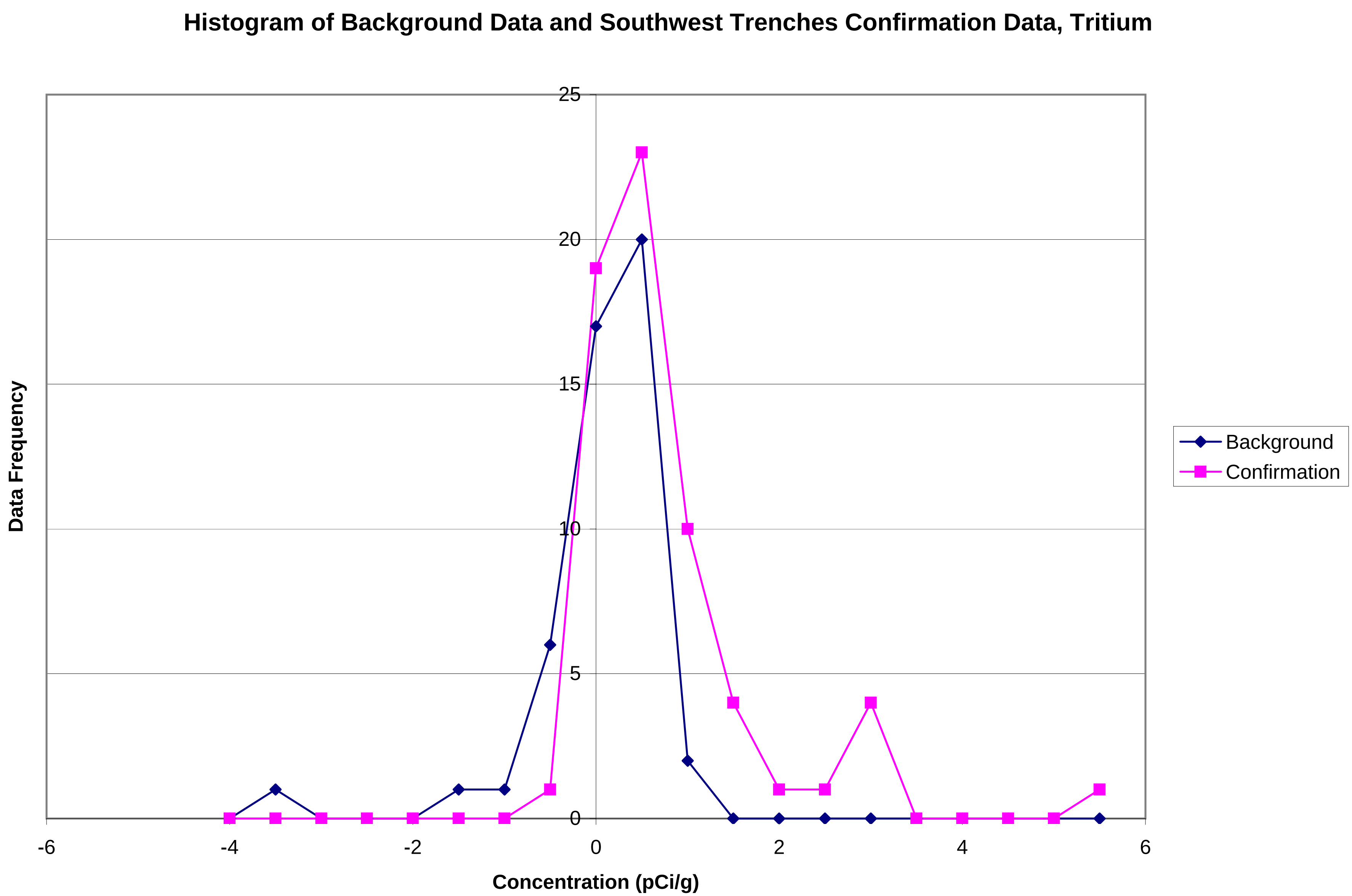


Histograms of Background Data and Southwest Trenches Confirmation Data, Th-228
Data Frequency
0
2
4
6
8
10
12
14
16
18
20
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Concentration [pCi/g]
Background
Confirmation



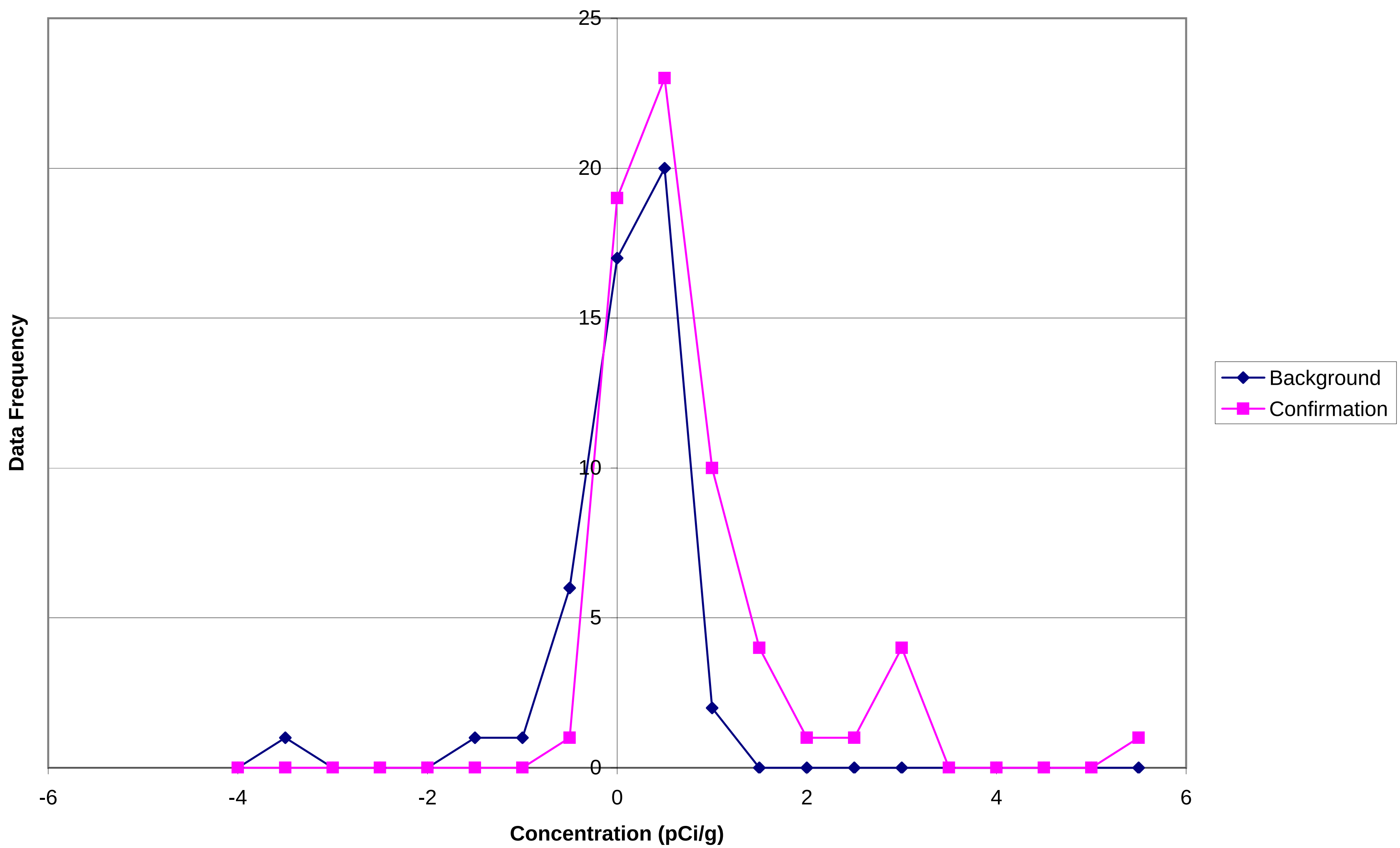
Histograms of Background Data and Southwest Trenches Confirmation Data, Th-232
Data Frequency
Ln(Concentration [pCi/g])
Background
Confirmation
25
20
15
10
5
0
-2.5
-2
-1.5
-1
-0.5
0

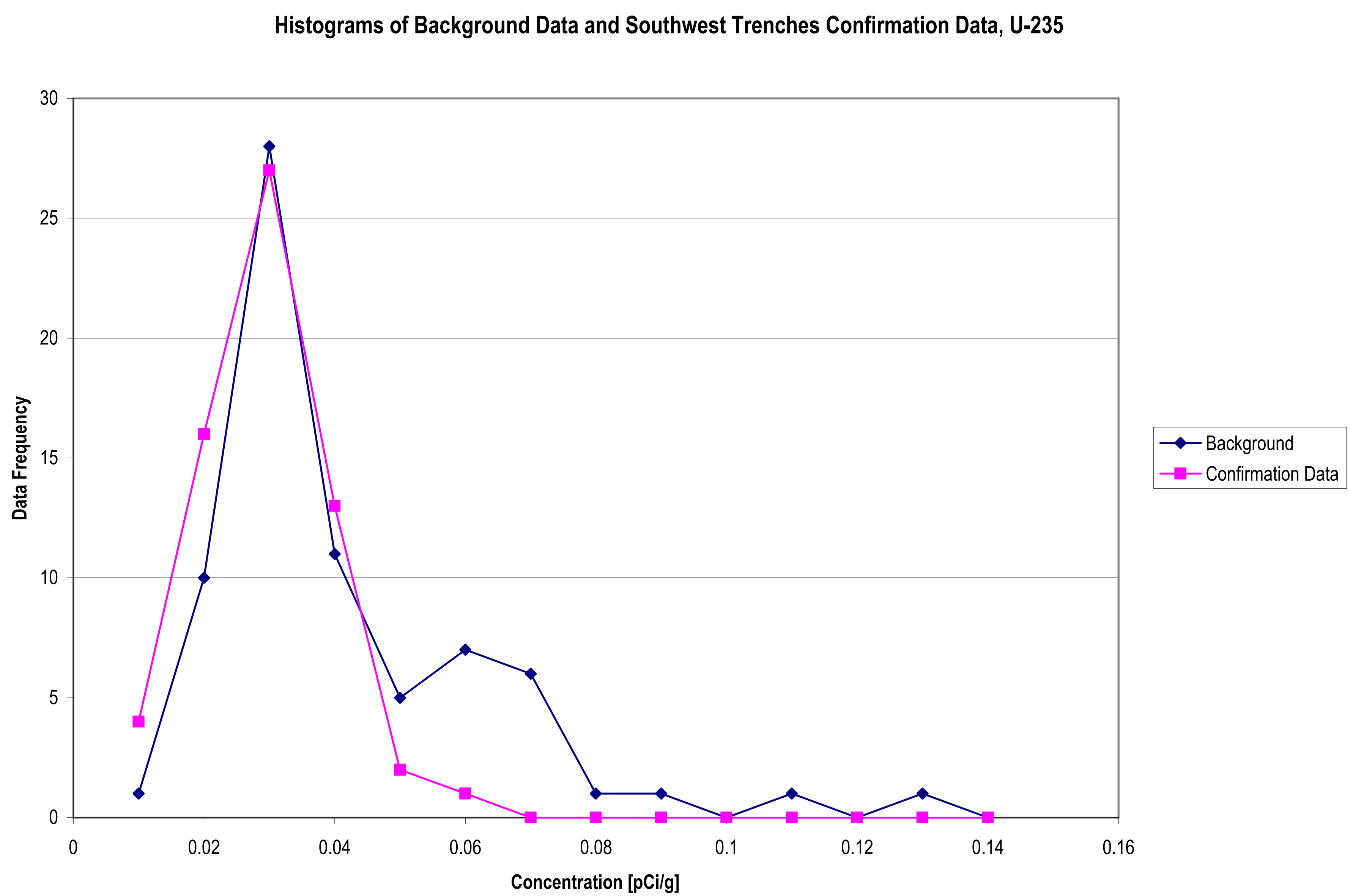

Histograms of Background Data and Southwest Trenches Confirmation Data, Th-234
Data Frequency
25
20
15
10
5
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Concentration [pCi/g]
Background
Confirmation

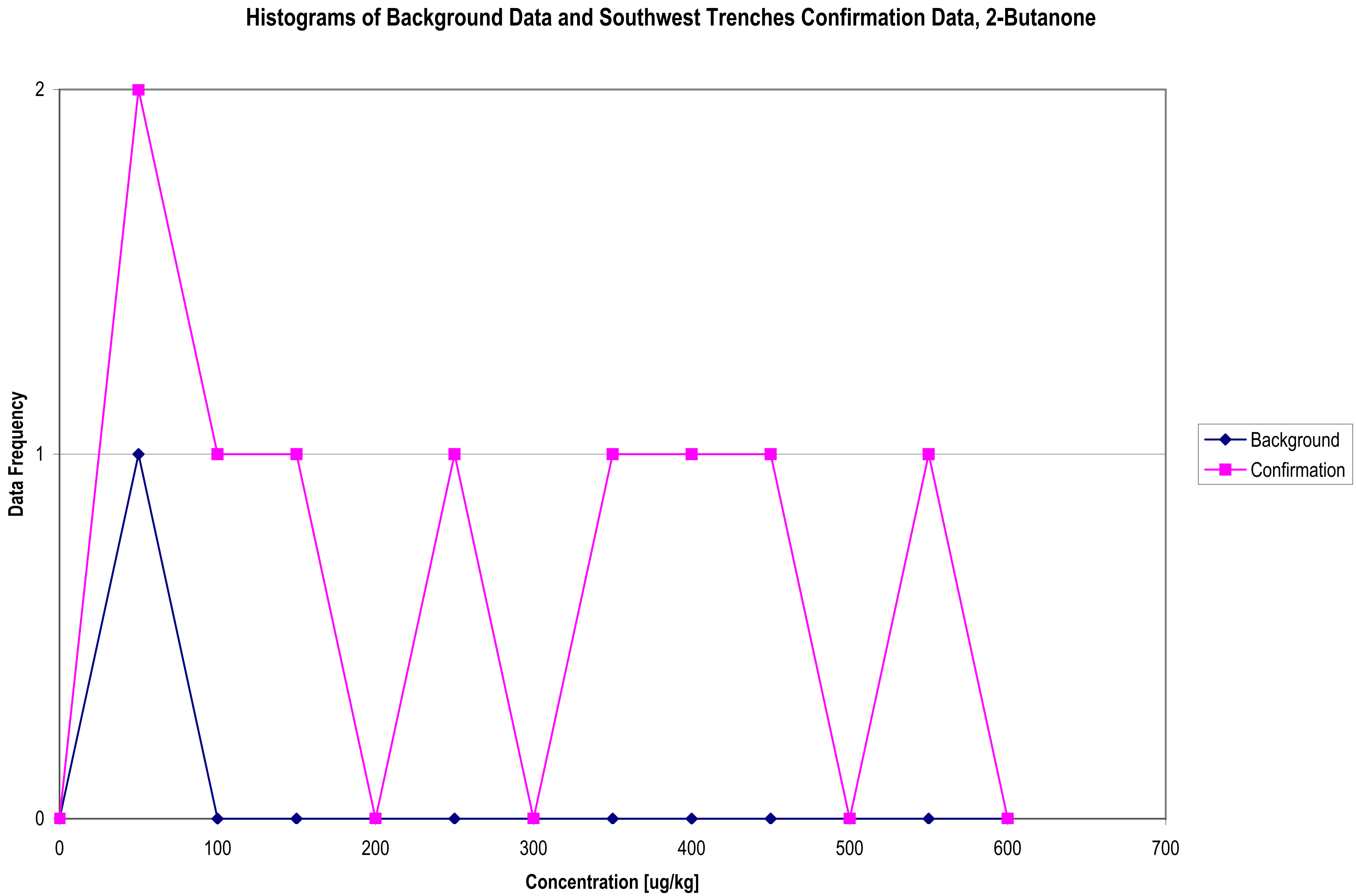


Histogram of Background Data and Southwest Trenches Confirmation Data, Tritium
Data Frequency
Concentration (pCi/g)
0
5
10
15
20
25
-6
-4
-2
0
2
4
6
Background
Confirmation

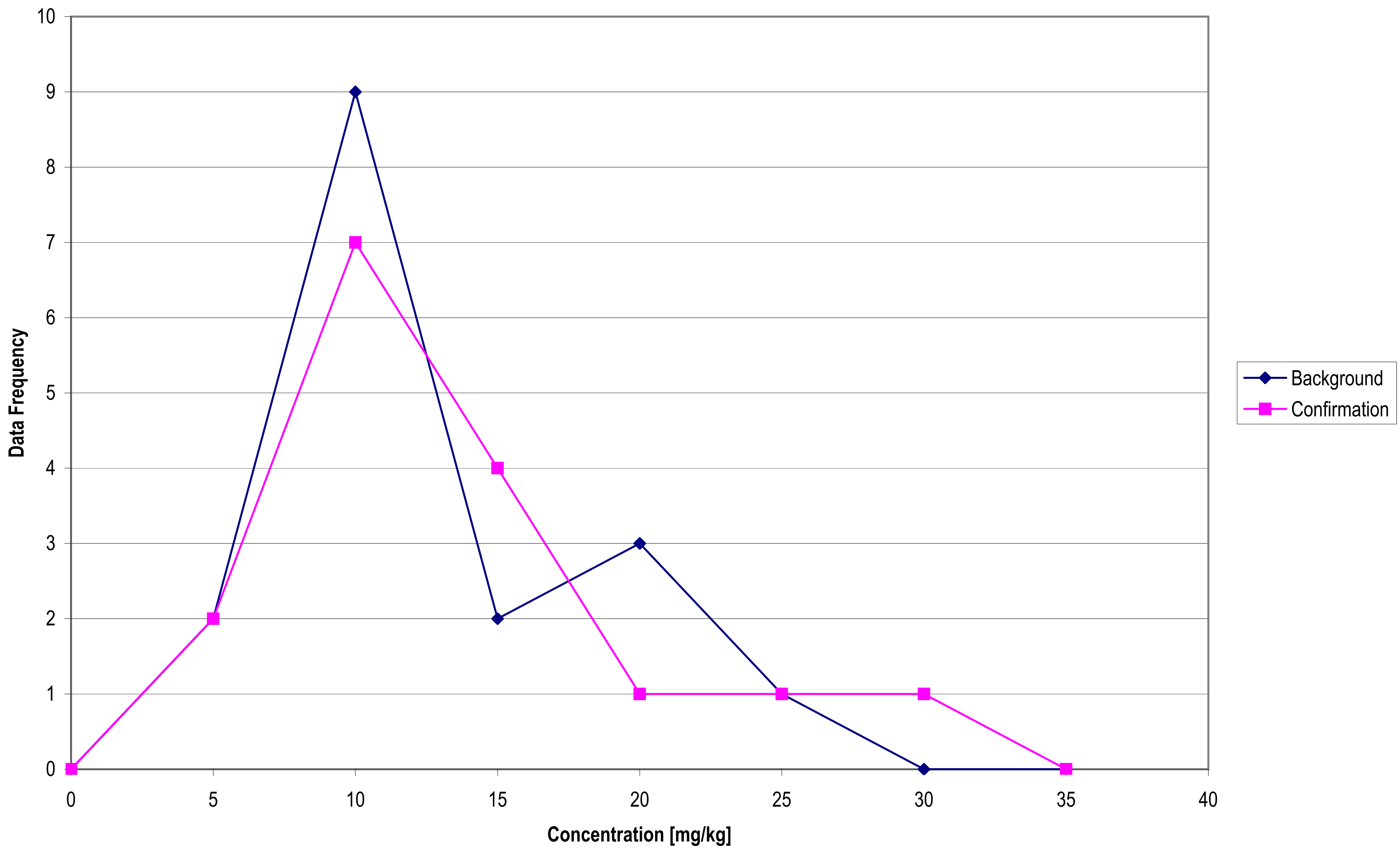
Histogram of Background Data and Southwest Trenches Confirmation Data, Tritium

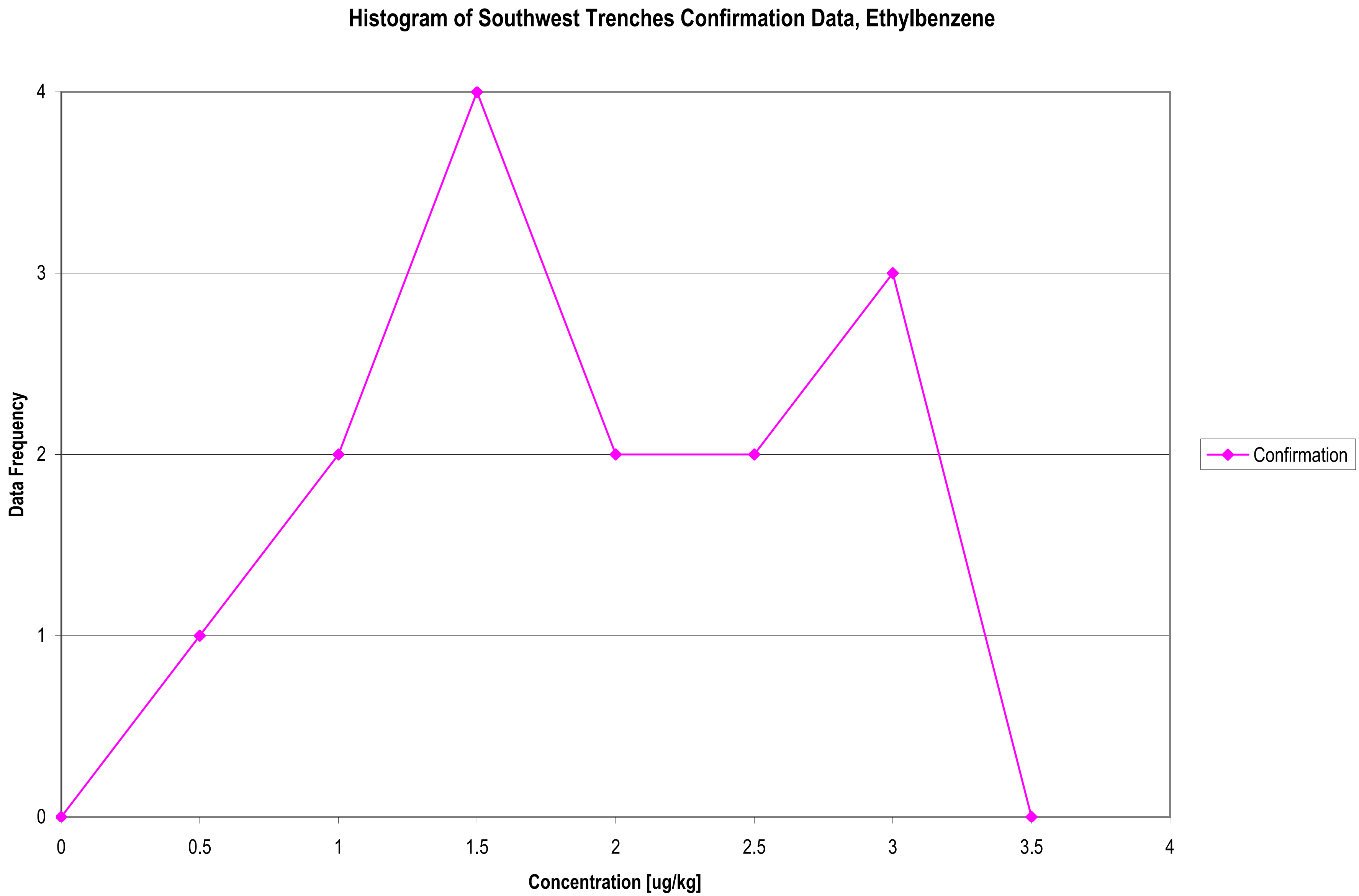


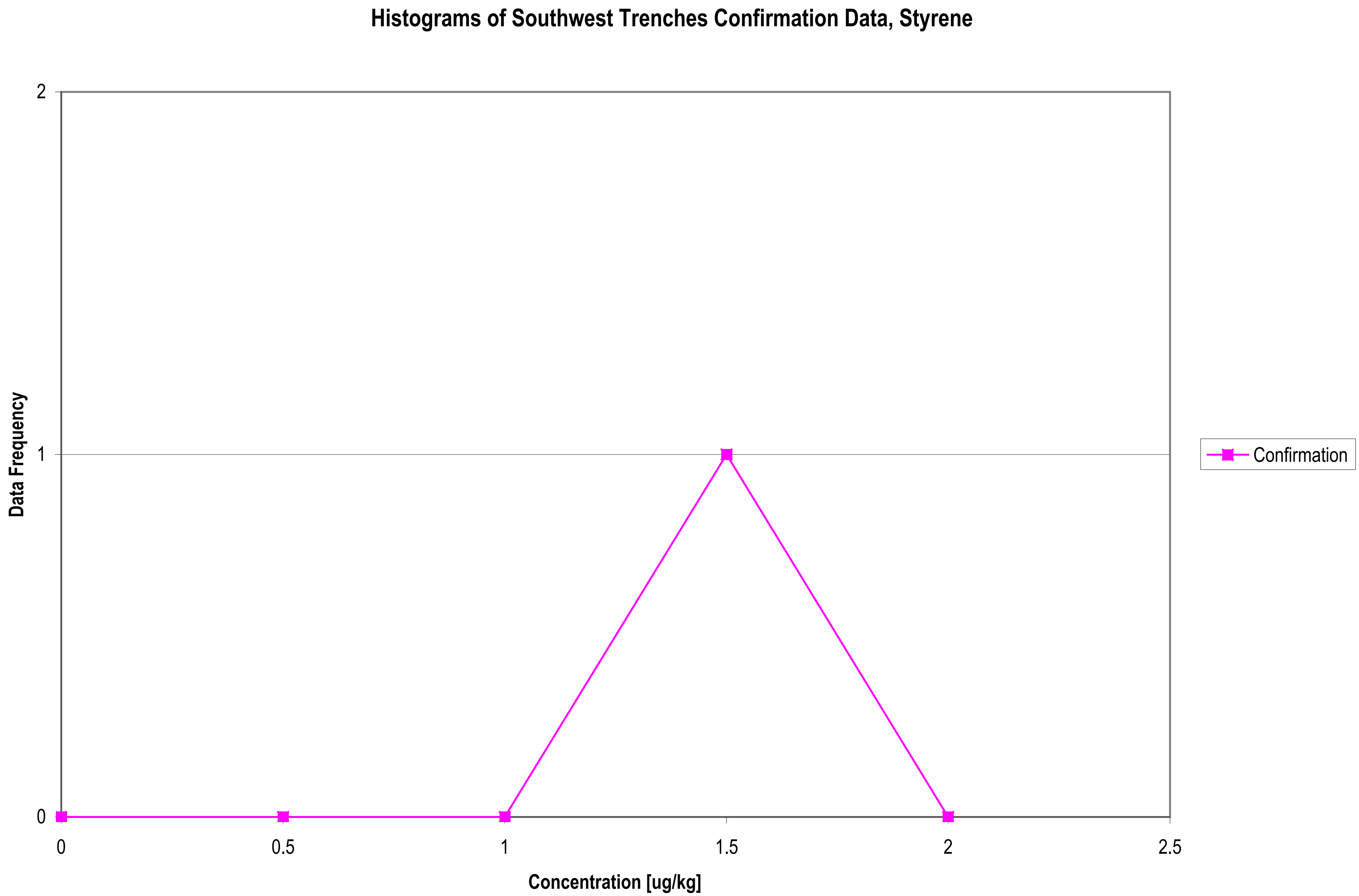

Histograms of Background Data and Southwest Trenches Confirmation Data, U-235
Data Frequency
Concentration [pCi/g]
Background
Confirmation Data
0
5
10
15
20
25
30
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16


Histograms of Background Data and Southwest Trenches Confirmation Data, 2-Butanone
Data Frequency
0
1
2
0
100
200
300
400
500
600
700
Concentration [ug/kg]
Background
Confirmation

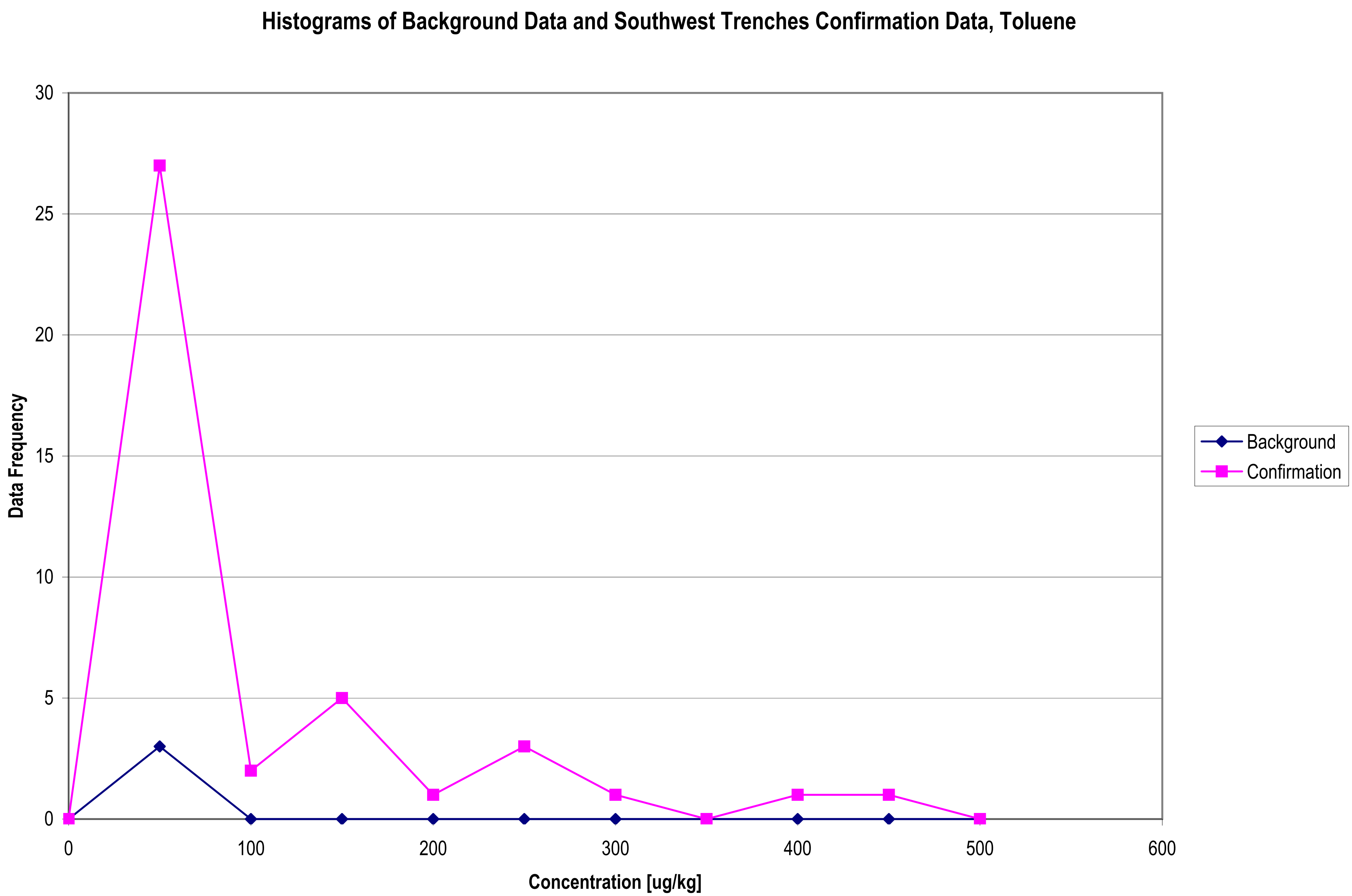
Histograms of Background Data and Southwest Trenches Confirmation Data, Acetone

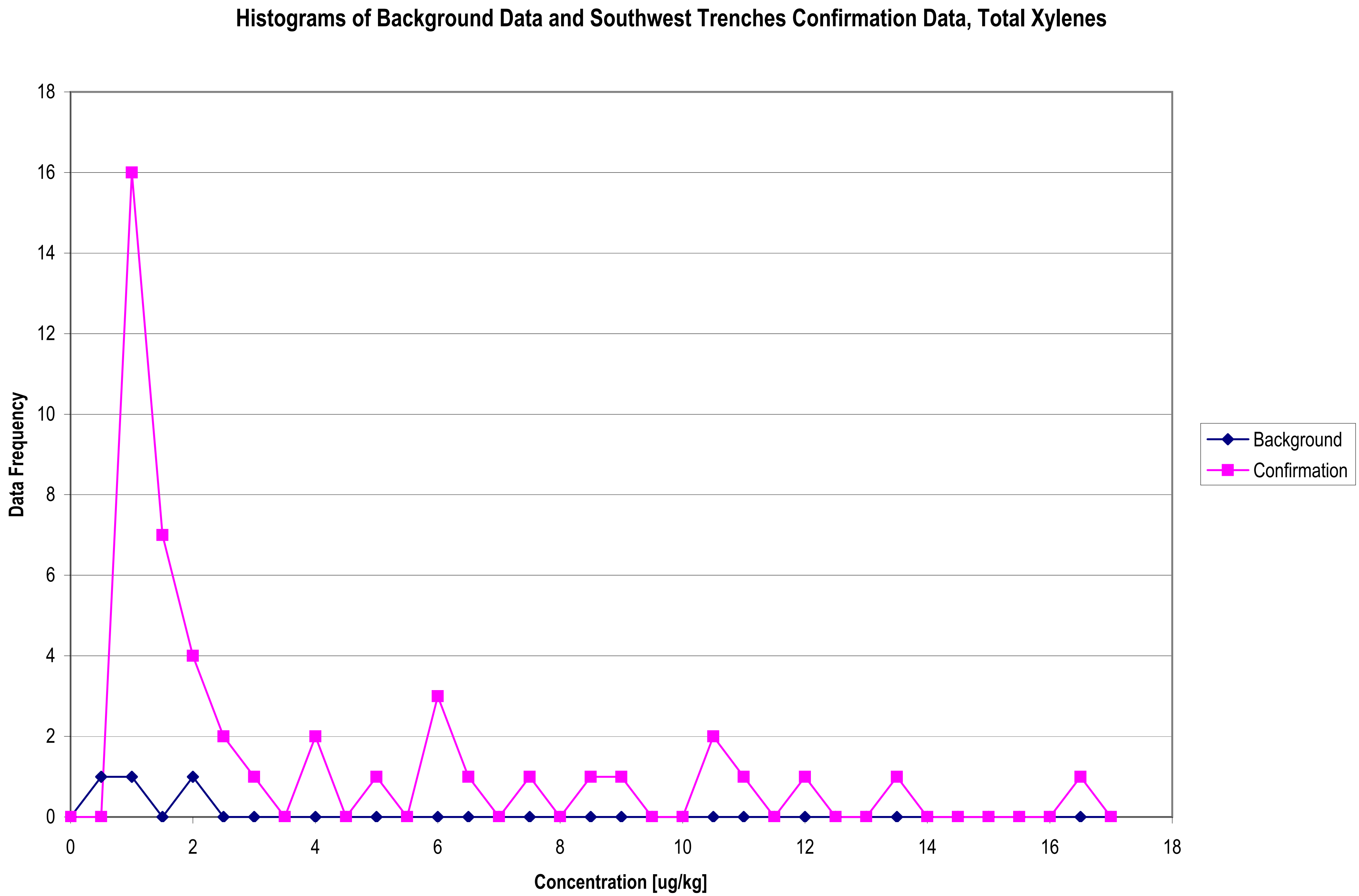



Histogram of Southwest Trenches Confirmation Data, Ethylbenzene
Data Frequency
Concentration [ug/kg]
Confirmation
0
1
2
3
4
0.5
1.5
2.5
3.5



Histograms of Southwest Trenches Confirmation Data, Styrene
Data Frequency
Concentration [ug/kg]
Confirmation
0
1
2
0
0.5
1
1.5
2
2.5


Histograms of Background Data and Southwest Trenches Confirmation Data, Toluene
Data Frequency
30
25
20
15
10
5
0
0
100
200
300
400
500
600
Concentration [ug/kg]
Background
Confirmation


Histograms of Background Data and Southwest Trenches Confirmation Data, Total Xylenes
Data Frequency
Concentration [ug/kg]
0
2
4
6
8
10
12
14
16
18
Background
Confirmation

APPENDIX F

VADOSE ZONE MODELING RESULTS

Table F-1. Vadose Zone Modeling Results, Southwest Trenches—Updated Southwest Trenches Lithology, 10.8 cm/yr Infiltration, LEHR Site, University of California, Davis, California

Constituent of Concern	NUFT Soil Result (mg/kg) or (pCi/g)	Depth Interval of Contamination	Half Life (years)	Time to peak at Ground Water Goal Level (years)	Ground Water Goal Conc. (µg/L) or (pCi/L)	Goal Reference
Methyl Mercury	0.973	3-7 ft	N/A	5,004	3.7	PRG
Mercury Sulfide	2.74	3-7 ft	N/A	5,004	11.0	MCL
Mercury , Elemental	0.529	3-7 ft	N/A	5,004	2.0	MCL
Methyl Mercury	0.0263	3-7 ft	N/A	5,000	0.10	1/2 L BG DL
Mercury Sulfide	0.0265	3-7 ft	N/A	5,000	0.10	1/2 L BG DL
Mercury, Elemental	0.0262	3-7 ft	N/A	5,000	0.10	1/2 L BG DL
Cesium-137	1.01E+10	10-12 ft	30.07	464	1.5	PRG
Cesium-137	>1.01E+10	5-8 ft	30.07	500	1.5	PRG
Cesium-137	9,527	10-12 ft	30.07	400	1.50E-06	PRG x 10^{-6}
Cesium-137	3.23E+08	5-8 ft	30.07	500	1.50E-06	PRG x 10^{-6}
Cesium-137	8.95E+11	10-12 ft	30.07	350	20	MCL
Cesium-137	>8.95E+11	5-8 ft	30.07	N/A	20	MCL
Cesium-137	1.27E+06	10-12 ft	30.07	400	2.00E-04	MCL x 10^{-6}
Cesium-137	2.88E+10	5-8 ft	30.07	500	2.00E-04	MCL x 10^{-6}
Cesium-137	7.04E+09	10-12 ft	30.07	500	1.0	1/2 L BG DL
Cesium-137	>7.04E+09	5-8 ft	30.07	N/A	1.0	1/2 L BG DL
Nitrogen (for NO_3)	1.70	5-20 ft	N/A	10	10,000	MCL
Nitrogen (for NO_3)	1.76	10-21 ft	N/A	0	10,000	MCL
Nitrogen (for NO_3)	4.05	5-20 ft	N/A	10	25,144	BG
Nitrogen (for NO_3)	4.41	10-21 ft	N/A	0	25,144	BG
Tritiated Water	3.51	0-25 ft	12.3	0	20,000	MCL
Tritiated Water	0.0193	0-25 ft	12.3	0	110	1/2 L BG DL

Table F-1. Vadose Zone Modeling Results, Southwest Trenches—Updated Southwest Trenches Lithology, 10.8 cm/yr Infiltration, LEHR Site, University of California, Davis, California (continued)

Constituent of Concern	NUFT Soil Result (mg/kg) or (pCi/g)	Depth Interval of Contamination	Half Life (years)	Time to peak at Ground Water Goal Level (years)	Ground Water Goal Conc. (µg/L) or (pCi/L)	Goal Reference
C-14 Methanol	0.00672	0-25 ft	5730	10	46	PRG
C-14 Methanol	0.292	0-25 ft	5730	10	2,000	MCL
C-14 Methanol	0.000511	0-25 ft	5730	10	3.5	1/2 L BG DL

Abbreviations:

BG	Background value based on 80% lower confidence limit on 95th quantile of concentrations detected in well UCD1-18 samples.
1/2 L BG DL	One half of the lowest reported background detection limit for well UCD1-18 samples. Applies to COCs whose UCD1-18 results were all ND.
COC	Constituent of Concern
ft	feet
MCL	State of California Primary Maximum Contaminant Level for Ground Water
mg/kg	milligrams per kilogram
N	Nitrogen
N/A	not applicable
ND	not determined
NUFT	Non-isothermal, Unsaturated Flow and Transport model
pCi/L	picoCuries per liter
PRG	US EPA Region IX Preliminary Remediation Goal for Tap Water
ug/L	micrograms per liter

Table F-2. Southwest Trenches—Updated General Lithology

Depth (ft)	Material (NUFT)	Soil Type	Density, Plasticity, Sorting	Estimated Permeability
0.00	ATM	Atmosphere		
0.00	ATM			
1.00	SAND	Sandy Silt	Medium-Stiff, Very Low Plasticity	Low to Medium
2.00	SAND			
3.00	SAND			
4.00	SAND			
5.00	NCLYSLT	Silty Clay	Stiff, Low to Medium Plasticity	Very Low
6.00	NCLYSLT			
7.00	NCLYSLT			
8.00	NCLYSLT			
9.00	NCLYSLT			
10.00	NCLYSLT			
11.00	NCLYSLT			
12.00	NCLYSLT			
13.00	NCLYSLT			
14.00	NCLYSLT			
15.00	NCLYSLT			
16.00	NCLYSLT			
17.00	NCLYSLT			
18.00	NCLYSLT			
19.00	NCLYSLT			
20.00	NCLYSLT		water table	
21.00	NCLYSLT			
22.00	NCLYSLT			
23.00	NCLYSLT			
24.00	NCLYSLT			
25.00	GEO1	Silty Sand	Medium Dense, Non-Plasticity, Well Sorted	Medium-High
26.50	GEO1			
27.00	NCLYSLT	Silty Clay	Very Stiff, Medium Plasticity	Very Low
41.00	NCLYSLT			
42.00	GEO1	Silty Sand	Medium Dense, Very Low Plasticity, Well Sorted	Medium-High
50.00	GEO1			

Table F-3. Summary of Physical and Hydraulic Properties for Representative Vadose Zone—Model Soil Types at the Southwest Trenches, LEHR Site, UC Davis, California

Chemical Specific Parameters		
COC	**Kd (ml/g)**	**Mol Wt**
Methyl Mercury	52	216.00
Mercury Sulfide	52	232.68
Mercury, elemental	52	200.60
Cesium-137	100	136.91
Nitrogen (for NO3)	0	14.00
Tritiated Water	0	20.02
C-14 Methanol	0	34.00

Formulas
Normalized Kd = rB.kd / f
Tortuosity Factor $= S^{(7/3)} . f^{(1/3)}$

Unit	**Porosity**	**Hydr. Cond. (cm/s)**	**Dry Bulk Density (g/cm3)**	**Van Genuten Parameter**	
				alpha (1/cm)	**m**
clayey sandy silt	0.35	1.00E-06	1.7	0.021	0.23
sand	0.3	1.00E-04	1.9	0.125	0.238