Haley & Aldrich, Inc.
326 South Wilmot Rd.
Suite A200
Tucson, AZ 85711-4060

Tel: 520.326.1898
Fax: 520.747.3491
HaleyAldrich.com

HALEY & ALDRICH

9 June 2006
File No. 20060-721/M470R

The Boeing Company
5800 Woolsey Canyon Rd.
MC-033-T487
Canoga Park, California 91304-1148

Attention: Mr. Arthur J. Lenox

Subject: Revised Interim Measures Work Plan for the Area I Burn Pit - Solid Waste Management Unit (SWMU) 4.8
Santa Susana Field Laboratory
Ventura County, California

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Dear Mr. Lenox:

Enclosed is our work plan, *Revised Interim Measures Work Plan for the Area I Burn Pit - Solid Waste Management Unit (SWMU) 4.8, Santa Susana Field Laboratory, Ventura County, California*. This revised work plan outlines proposed interim measures pursuant to a 27 January 2006 letter from the Department of Toxic Substances Control (DTSC) regarding the Area I Burn Pit – Solid Waste Management Unit (SWMU) 4.8 and includes revisions requested by DTSC.

We appreciate the opportunity to work with The Boeing Company on this project. Please advise if you have any questions or wish further discussion of this report.

Sincerely yours,
HALEY & ALDRICH, INC.

original signed by

William R. Drake
Staff Geologist
California Professional Geologist No. 5799

PROFESSIONAL GEOLOGIST
WILLIAM RUFF DRAKE
No.7599
STATE OF CALIFORNIA

original signed by

Sheldon D. Clark
Vice President

Enclosures

REVISED INTERIM MEASURES WORK PLAN
FOR THE AREA I BURN PIT
SOLID WASTE MANAGEMENT UNIT (SWMU) 4.8
SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

by

Haley & Aldrich, Inc.
Tucson, Arizona

For

The Boeing Company
5800 Woolsey Canyon Road
MC: 033-T487
Canoga Park, California 91304-1148

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1. INTRODUCTION

This work plan outlines proposed interim measures (IM) that will be completed in response to a 27 January 2006 letter from the Department of Toxic Substances Control (DTSC) regarding the Area I Burn Pit – Solid Waste Management Unit (SWMU) 4.8 (SAIC, 1994) at the Santa Susana Field Laboratory (SSFL), Ventura County, California. The goal of the proposed IM is to remove known elevated-chemicals in soils and drainage sediments at the SWMU and to better characterize the SWMU by addressing data gaps.

The work plan describes limited soil removal and presents a data collection program to characterize existing conditions at the Area I Burn Pit – SWMU 4.8, referred to here as the "SWMU." The Thermal Treatment Facility (TTF) Interim Status Facility, which is located within the SWMU, is addressed under a separate Closure Plan. This work plan serves as a comprehensive collection of data pertinent to the SWMU and as an amendment to the *Supplemental Soil Sampling Plan for the Thermal Treatment Facility (TTF) and Area I Burn Pit-Solid Waste Management Unit (SWMU) 4.8* (Haley & Aldrich, 2005a) from which all earlier proposed samples and exploratory trenches are included as part of the IM.

After the completion of the work described herein, all site data will be compiled and submitted in the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report.

1.1 Objectives and Scope of Interim Measures Work Plan

The proposed scope for this work plan was developed based on the 27 January 2006 letter from DTSC (**Appendix A**) and discussion with DTSC staff on 2 March 2006. The primary objectives of the work plan are to:

- Remove elevated concentrations of dioxins, chromium, and other co-located chemicals in soils at the SWMU, based on both historical and recent analytical data;
- Complete the characterization of the extent of remaining chemicals in soils and drainage sediments at the SWMU and address known data gaps associated with the SWMU; and
- Further delineate existing investigation areas at the SWMU and identify potential investigation area boundaries surrounding the TTF Interim Status Facility, SWMU 4.8, and including areas adjacent to the SWMU boundaries.

Additional IM activities, if warranted to meet the objectives of this work plan, will be addressed in an IM addendum pending approval by the DTSC. Field activities, sampling, or reporting for the TTF will be conducted in accordance with the TTF Interim Status Facility Closure Plan. Any data collected or information gathered during the preparation and implementation of this IM and included in the subsequent IM report will be shared and utilized for the benefit of the TTF Closure Plan. Any further corrective actions and evaluation of the TTF Interim Status Facility, the SWMU, and the adjacent areas will be in accordance with the approved Revised Standardized Risk Assessment Methodology (SRAM) Work Plan (MWH, 2005) and will be addressed in RFI reporting for the Eastern Bundled RFI Report (Group 1).

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1.2 Facility Description

The Area I Burn Pit (SWMU 4.8) is approximately 5.8 acres in size and is located in the southern portion of Area I of the SSFL (**Figure 1**). The TTF Interim Status Facility lies within the Burn Pit area, or SWMU; however, closure activities for the TTF Interim Status Facility are not addressed in this work plan and will be accomplished in a separate Closure Plan. The TTF Interim Status Facility and the Area I Burn Pit, or SWMU, are briefly described here.

1.2.1 TTF Interim Status Facility

The TTF Interim Status Facility lies within and near the center of the eastern portion of the SWMU and formerly consisted of two concrete pads (Burn Pit 2 and Concrete Pad 2) (EMCON, 1990) surrounded by earthen berms (**Figure 2**). The TTF Interim Status Facility was used for evacuation of pressurized cylinders, and destruction of energetic wastes (such as nitroglycerin and ammonium perchlorate), plasticizers, and binders (EMCON, 1990).

1.2.2 Area I Burn Pit (SWMU 4.8)

The Area I Burn Pit (SWMU 4.8) area surrounding the TTF Interim Status Facility is defined here as the SWMU (**Figure 2**). The SWMU formerly consisted of several earthen and concrete-lined ponds, a control center and two explosives storage sheds. Both Concrete Ponds 2 and 3 were historically used for burning wastes (Groundwater Resource Consultants [GWRC], 1992). The SMWU was primarily used for the destruction of explosive and flammable wastes by open burning (GWRC, 1992). Wastes treated in the SWMU primarily included solvents and fuels generated from other areas at the SSFL (SAIC, 1994). The SWMU was operated intermittently between approximately 1958 and the early 1980s.

1.3 History of Investigations

Since the early 1980's, multiple remedial investigations and actions have been conducted at the TTF Interim Status Facility and Area I Burn Pit (GRWC, 1992; Boeing, 2003). These historical activities include:

- 1981-1982 Geophysical surveying, remedial excavations, soil sampling and analysis (Section 1.3.1);
- 1990 Soil sampling and analysis (Section 1.3.2);
- 1993 Geophysical surveying, remedial excavations, soil sampling and analysis (Section 1.3.3);
- 1994 Soil sampling and analysis (Section 1.3.4);
- 2003 Soil leachate and surface water sampling and analysis (Section 1.3.5);
- 2005 Soil sampling and analysis (Section 1.3.6); and
- 2006 Soil sampling and analysis (Section 1.4).

These activities are described below in more detail. **Figures 3** through **8** include selected analytical results from the historical activities described below. Only metals with concentrations above SRAM background levels are shown. All other concentrations of metals are below detection limits and/or SRAM background levels. Dioxins are presented as calculated toxic equivalents (TEQs).

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1.3.1 1981-1982

Rockwell International Corporation (Rockwell) contracted Harding Lawson Associates to conduct a radar scan to identify buried objects and disturbed soils (Rockwell, 1982). Numerous areas of buried debris, disturbed soils, and localized subsurface anomalies identified using geophysical equipment were excavated. Approximately 1,600 cubic yards of materials and soils were excavated and removed from the SWMU, of which 1,300 cubic yards were designated as non-hazardous waste, and 300 cubic yards were designated as hazardous waste. The excavated areas are shown on **Figure 2**.

Twenty confirmation soil samples were collected from the excavation sites, and one background soil sample was also collected. The samples were analyzed for a suite of organic constituents and selected metals, and the locations are identified on **Figure 2** by the designation "0229-n." The analytical results for these soil samples are summarized on **Figures 4 - 6** and are included in **Appendix A**. The work was performed under the direction of the Los Angeles Regional Water Quality Control Board (LARWQCB), and was reported to the LARWQCB and the California Department of Health Services.

1.3.2 April 1990

Rockwell personnel collected six soil samples, from the immediate vicinity of the TTF, in support of TTF site closure (GWRC, 1992). The collected soil samples were analyzed for metals. The analytical results for these soil samples are presented in **Appendix A**; however, the soil sample locations were not reported.

1.3.3 June 1993

Rockwell contracted ICF Kaiser to perform a geophysical survey across the SWMU using a magnetometer/gradiometer to detect buried metal objects. After the survey, Rockwell personnel used the magnetic gradient map as a guide to excavate and remove buried metal objects. The excavation locations, based on report maps, are shown on **Figure 2**.

Following the survey, at the direction of the DTSC, GWRC collected 70 soil samples, including three background samples, from surface and soil boring locations. The analytical suite and soil boring locations were reported in the *Sampling and Analysis Plan* (GWRC, 1992). The samples were analyzed for metals, total petroleum hydrocarbons, volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs) (GWRC, 1993). The sample locations are identified on **Figure 2** by the designations "SL-*n*" and "RR-*n*". The "RR" samples were collected at the request of Rockwell personnel during the geophysical survey excavation. Specific analyses requested for each of these samples were based on materials observed at the excavations. The sample results are summarized on **Figures 4 – 6** and are included in **Appendix A**.

1.3.4 May 1994

Based on the elevated concentration of 4,000 milligrams per kilogram (mg/kg) of pentachlorophenol, identified at sample location SL-4 in 1993 (**Figure 4**), DTSC requested that new soil samples be collected in this area and analyzed for dioxins. GWRC personnel collected four soil samples for dioxins analysis from within Earth Pond 2 of the SWMU; these locations are identified on **Figure 4** by the designation

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"DR-*n*." TEQs calculated for the soil samples range from 0.117 to 1,880 picograms/gram (pg/g) (**Figure 4** and **Appendix A**).

1.3.5 March 2003

MWH personnel collected 11 soil leachate and surface water samples for perchlorate analysis from the general vicinity of the SWMU (MWH, 2003; Boeing, 2003) (**Figure 7**). Perchlorate was not detected in the soil leachate samples, but one surface water sample contained a perchlorate concentration of 0.0043 mg/L, just slightly over the reporting limit of 0.004 mg/L (**Appendix A**). The sampling was performed at the request of the DTSC.

1.3.6 April 2005

At the direction of the DTSC, Haley & Aldrich and DTSC personnel collected a total of six soil samples for dioxins analysis within Burn Pit 2 of the SWMU (Haley and Aldrich, 2005b). The sample locations are shown on **Figure 4** and are identified by the designation "TTFD-*n*." TEQs calculated for the five soil samples range from 8.18 to 5,257.4 pg/g (**Table I**).

1.4 February 2006 (Pre-IM Sampling)

In February 2006, MWH personnel collected 15 soil samples across the SWMU, including the TTF Interim Status Facility, as part of pre-interim measures activities. The purpose of the sampling and analyses was to provide general characterization in key locations for guidance of interim measures proposed in this work plan. The sample locations (**Figures 7** and **8**) are identified by the designation "TTBS*n*." Samples were collected from 0.05 feet below land surface (bls) (surface soil sample), 0 - 0.5 feet bls, and 0.5 - 1.0 feet bls, and were analyzed for metals, polycyclic aromatic hydrocarbons (PAHs), dioxins, and perchlorate (**Table II**). The analyses were performed on the soil matrix samples, with the exception of the perchlorate analysis which was conducted on soil leachate samples. The 2006 pre-IM analytical results are summarized in **Figures 4 - 8** and **Tables III – VI**. The laboratory report and validation report are included in **Appendix A**.

1.5 Summary of Analytical Results from Previous Investigations

Historical and pre-interim measures analytical data indicate the locations of the most highly-elevated concentrations of chemicals at the SWMU.

- Earth Pond 2 area (**Figure 4**). TEQs calculated for dioxins in soil samples range to a maximum of 5,257.4 pg/g, as reported for sample TTFD-1. Pentachlorophenol was detected at a concentration of 4,000 mg/kg in the sample from location SL-4.

- Sample location RR-8 (**Figure 4**). Chromium impacts were identified in a sample collected from locations RR-8, based on a detected concentration of 860 mg/kg (**Figure 4**).

- Concrete Ponds 2 and 3 area (**Figures 5 and 6**). Dioxins with a calculated TEQ concentration of 60 pg/g were identified in pre-IM sample TTBS17. Several metals were detected in samples at concentrations that exceed SRAM background levels, including barium at 350 mg/kg, chromium at 290 mg/kg, copper at 89 mg/kg, lead at 84 mg/kg, molybdenum at 54 mg/kg, and nickel at 1,300 mg/kg.

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- Earth Pond 3 (**Figure 6**). TCE was detected at a concentration of 190 mg/kg in a sample collected from 4 - 4.5 feet bls at location SL-28. In the same sample, petroleum hydrocarbons and fuel hydrocarbons (C7 - C28 as diesel) were detected at concentrations of 6,500 mg/kg and 4,400 mg/kg, respectively.

Analytes detected at other areas of the SWMU include lower concentrations of dioxins, perchlorate, VOCs, petroleum hydrocarbons, cyanide, and metals above SRAM background levels (**Figures 4 – 8**). At Burn Pit 2 of the TTF Interim Status Facility, perchlorate was detected in soil leachate sample TTBS24 at a concentration of 360 μg/L, and dioxins were detected at a calculated TEQ concentration of 60 pg/g (**Figure 8**).

The highest dioxin TEQs at the SWMU are at Earth Pond 2 and appear to be co-located with elevated pentachlorophenol and metals with concentrations above SRAM background levels (**Figure 4**). The detected concentration of chromium at 860 mg/kg at location RR-8 (**Figure 4**) is above the SRAM background level of 37 mg/kg and above the EPA Preliminary Remediation Goal (PRG) of 210 mg/kg for chromium in residential soil. The elevated chromium is co-located with other metals with concentrations exceeding SRAM background. The elevated TEQ dioxin concentration for sample TTBS17 at Concrete Ponds 2 and 3 appears co-located with other chemicals, including chromium (**Figure 5**). TCE, petroleum hydrocarbons, and metals above SRAM background levels are co-located at Earth Pond 3 (**Figure 6**).

Based on analytical results discussed above, areas with the most highly-elevated concentrations of dioxins, chromium, and other chemicals are identified, and their extents have been better constrained by pre-IM soil sampling. These areas are the targets for the interim measures proposed in this work plan.

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2. PROPOSED INTERIM MEASURES

The proposed interim measures presented in this work plan address the known areas of impacted surficial media of the SWMU and also address data gaps in and nearby the SWMU. The interim measures will be conducted in two phases as described below.

2.1 Proposed Interim Measures (Phase I)

Phase I of the interim measures addresses the SWMU area and includes the removal of soil containing the highest levels of dioxins, chromium, and other co-located chemicals to reduce the potential for migration. The presumptive remediation approach will be shallow soil excavation in three locations, identified as Excavations A' – C', as depicted on **Figure 8**. Excavation will be performed with a back hoe or other similar equipment. To minimize the potential of field activities impacting sensitive areas at the SWMU, a biological, cultural and paleontological resource assessment survey was conducted in May 2006 (SWCA Environmental Consultants, 2006) (**Appendix A**). Mitigation measures discussed in the assessment will be implemented to minimize potential impacts.

2.1.1 Interim Measures Clean-up Goals and Excavation Limits

The lateral and vertical extent of excavation is proposed here based on historic and pre-IM analytical data for the SWMU. The IM clean-up goals target elevated concentrations of dioxins and chromium at the SWMU.

- Based on the evaluation of historical and pre-IM data for the SWMU, and following the clean-up goal used for interim measures at the Former Sodium Disposal Facility (FSDF) at SSFL (IT Corporation, 1999), the IM clean-up goal for dioxins is a TEQ concentration of 13.1 pg/g.

- The IM clean-up goal for chromium is a concentration of 185 mg/kg, which is 5 times the SRAM background level of 37 mg/kg and below the EPA PRG of 210 mg/kg for chromium in residential soil. The use of 5-times background is considered appropriate because the SRAM risk assessment will use an area-based average soil concentration for the exposure point concentration. It is anticipated that if chromium is cleaned up to this level, then no further clean-up to address chromium in soil will be needed.

The analytical data suggest that areas with concentrations of dioxins and chromium that exceed the IM clean-up goals are co-located with other chemicals, including TCE, petroleum hydrocarbons, and metals with concentrations above SRAM background levels.

Using these IM clean-up goals for dioxin and chromium, three areas are delineated for excavation to remove soil exceeding the clean-up goals. The anticipated limits of excavation are depicted on **Figure 8**. Adjustments to the limits of excavation may be warranted based on visual field evidence (e.g., stained or disturbed soil, buried debris, and burned material). Excavation volumes are estimates and do not include potential additional excavation that may be necessary in order to meet the clean-up goals of this work plan. Although not directly targeted, some additional chemicals will likely be excavated, based on their co-location with the dioxins and chromium above the IM clean-up goals. Post-excavation confirmation sampling will be performed as described in Section 2.2.1.

Although dioxins levels at Burn Pit 2 of the TTF Interim Status Facility exceed the IM clean-up goal, the facility will be excluded from IM soil removal activities and will be

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addressed according to the TTF Closure Plan. The TTF Interim Status Facility occupies a total of approximately 6,850 square feet (0.16 acres) within the SWMU (5.8 acres). Potential migration of chemicals at the TTF is expected to be minimal due to the relatively small TTF area and the implementation of Best Management Practices (BMPs) discussed in Section 2.1.5.

2.1.2 Excavation A'

Excavation A' is located in the southwestern portion of SWMU 4.8. Historical and pre-IM sampling results indicate elevated levels of dioxin, pentachlorophenol, and metals in soils at Earth Pond 2. Excavation A' targets dioxins TEQs greater than the IM clean-up goal at Earth Pond 2 (**Figure 8**). The boundary of the proposed excavation is along the inner portion of the Earth Pond 2 containment berm and extends approximately 25 feet east of sample location TTBS31 (**Figure 8**). The proposed excavation is to bedrock, which is at approximately 1.5 to 2.5 feet bls. Uppermost weathered bedrock will be removed if warranted by visual field evidence of contamination, such as staining and odor. The anticipated in-situ excavation volume, including the inner portion of the containment berm of Earth Pond 2, is estimated to range from approximately 500 to 1,000 cubic yards.

2.1.3 Excavation B'

Excavation B' is located in the west-central portion of the SWMU 4.8. At soil sample location RR-8, chromium was detected at a concentration of 860 mg/kg, which exceeds the interim measures clean-up goal of 185 mg/kg. The original sample location was chosen because of the presence of discolored soil, broken glass, and metal debris identified during the 1993 geophysical survey. The Excavation B' boundary is delineated based analytical data from pre-interim measures sample locations TTBS27, TTBS28, TTBS29, TTBS30 (**Figure 8**; **Tables III - VI**). The proposed excavation is to bedrock, which ranges from approximately 1 to 5 feet bls in this area. Uppermost weathered bedrock will be removed if warranted by visual field evidence of contamination, such as staining and odor. The anticipated in-situ excavation volume is estimated to range from approximately 280 to 500 cubic yards.

2.1.4 Excavation C'

Excavation C' is located in the southeastern portion of SWMU 4.8. Chromium was detected in the vicinity of Concrete Ponds 2 and 3 at a concentration of 290 mg/kg, which exceeds the IM clean-up goal of 185 mg/kg. The dioxins TEQ concentration for the sample collected from this area is 60 pg/g, which exceeds the IM clean-up goal of a TEQ of 13.1 pg/g. Analytical data indicate that elevated levels of TCE, hydrocarbons, and other metals exceeding SRAM background levels are also located in this area, at Earth Pond 3. The anticipated limit of Excavation C' has been defined based on the elevated chromium and dioxins concentrations, as well as co-located chemicals (**Figure 8**). The proposed excavation is to bedrock, which ranges from 0 to approximately 5 feet bls in this area. Uppermost weathered bedrock will be removed if warranted by visual field evidence of contamination, such as staining and odor. The anticipated in-situ excavation volume is estimated to range from approximately 3,000 to 5,000 cubic yards.

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2.1.5 Post-Excavation Area Management

Vehicular traffic, other than the excavation equipment, will be prohibited inside the active excavations. It is anticipated that soils will either be directly loaded into bins or stockpiled using the excavation equipment. Excavations will be clearly marked and secured with fencing to prevent inappropriate entry into the excavation areas during and after excavation field activities, as per the Site-specific Health and Safety Plan. Before the rainy season, the excavations will be secured according to BMPs with devices such as plastic sheeting, sand bags, silt-fencing and hydro-mulch to prevent migration of impacted soils.

The potential for incidental runoff from stockpiles will be minimized by covering soil stockpiles with secured plastic. Additional areas of the SWMU will be addressed with BMPs before the rainy season. The TTF Interim Status Facility will be covered with plastic before the winter rainy season in order to minimize potential migration of contaminants from the facility. Surface water controls, such as temporary barriers to prevent surface water runoff from entering the excavations, will be implemented according to the Storm Water Pollution Prevention Plan (SWPPP). Potential excavation backfilling with clean soil, and localized recontouring options according to BMPs, will be evaluated after review of interim measures soil sampling results and upon approval from DTSC. The general surface water drainage patterns of the SWMU will not be significantly altered by IM activities. Re-vegetation of disturbed portions of the site is not expected but BMPs will be implemented.

2.1.6 Soil Management and Disposal

Based on existing soil analysis data, and pending approval by the appropriate disposal facilities, it is anticipated that the majority of excavated soil will be transported immediately following excavation. Excavated soil that is not directly hauled to disposal facilities will be stored in segregated stockpiles or in covered soil bins pending proper waste characterization and removal to appropriate disposal facilities. To the extent practical, stockpiles or soil bins will be composed of soil from a single source (e.g., from only Excavation A'). Based on available analytical data, soil expected to exceed hazardous waste levels will be managed separately.

For the purpose of waste profiling for disposal, chemical analysis will be conducted by collecting representative samples of excavated material and analyzing them at a state-certified laboratory. The waste will be classified in accordance with regulations described in California Code of Regulations, Title 22, Sections 66261.21 to 66261.24. Analytical results will be submitted to the appropriate disposal facilities for approval and disposal of waste. Non-hazardous waste is anticipated to be transported to the Antelope Valley Landfill (Class 3) in Palmdale, CA, and hazardous waste, if encountered, will be transported to the Kettleman Hills Facility (Class I, II, III) in Kettleman City, CA, operated by Chemical Waste Management, or similar permitted facilities. Dust suppression measures (see Section 2.1.7) will be employed, as necessary, during the loading of waste transportation trucks. Trucks transporting excavation material will be spaced at appropriate intervals during transport to the designated disposal facility and will not exceed 20 trucks per day. The trucks will be covered and will follow all Department of Transportation (DOT) regulations. A qualified, fully-licensed, and insured transporter or combination of transporters will be used.

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2.1.7 Dust Suppression

Appropriate dust suppression techniques will be implemented during soil excavation, transfer, and transportation activities. Dust suppression techniques include fine spraying of water on the active excavation areas, and covering non-active excavations and stockpiles with plastic. Dust suppression measures will be increased if visible dust is observed during excavation and loading. Oversight personnel will be present at all times that excavation or soil movement occurs to monitor dust suppression efforts.

2.1.8 Dust and Vapor Monitoring

The dust and vapor monitoring program will be described in detail in the Site-Specific Health and Safety Plan that will follow submission of this work plan. Ambient air and dust monitoring will be performed both upwind and downwind of operations during excavation activities. Vapor monitoring for VOCs will be performed continuously during active excavation. On-site personnel in the exclusion zone will use appropriate personal protection equipment (PPE) as outlined in the Site-Specific Health and Safety Plan.

2.1.9 Decontamination

Equipment and personnel working in the exclusion zone will undergo decontamination procedures as described in the Site-Specific Health and Safety Plan, prior to each egress from the work area. Decontamination rinse water will be collected and containerized in labeled drums, pending appropriate waste characterization and disposal.

2.2 Proposed Interim Measures (Phase II)

Phase II of the interim measures may be performed concurrently with the proposed Phase I excavations and will include 1) post-excavation confirmation sampling and 2) additional soil characterization sampling and analysis across the SWMU and at areas adjacent to the SWMU.

The purpose of Phase II soil sampling is to 1) evaluate the effectiveness of the soil excavations, 2) delineate the extent of known impacted soil in targeted investigation areas to determine if further interim measures removal actions are warranted, and 3) address identified data gaps within and adjacent to the SWMU as necessary for the RFI report. Phase II soil sampling will include an extensive analytical suite [EPA Methods for SVOCs (8270C), formaldehyde (8315), metals (6010B, 6020, 7471A), TPH (8015), perchlorate (314.1), fluoride (300.0), pH (9045), PCBs (8082), VOCs (8260B), PAHs (8270 SIM), and NDMA (8270 SIM)] for potential contaminants in addition to chromium and dioxins (1613B) (**Table VIII**).

Soil samples will be collected, prepared, packaged, and shipped as described in the RFI Work Plan Addendum and the Addendum Amendment (Ogden, 1996 and 2000). Chain of custody records will be prepared pursuant to the procedures detailed in the RFI Work Plan Addendum and the Addendum Amendment (Ogden, 1996 and 2000). To insure attainment of the data quality objectives (DQOs), the Quality Assurance/Quality Control (QA/QC) program for soil sampling will be consistent with the SSFL site-wide RFI QAPP (Ogden, 1996 and 2000) and the Perchlorate QAPP Addendum (AMEC, 2003).

As per RFI protocols, duplicate field samples will be collected to measure the consistency and precision of the sample collection. A target of 10% duplicate samples will be collected from

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locations distributed across the SWMU. Split samples will be collected in the identical manner as primary samples but will be submitted to an alternate laboratory for analysis. Split samples will be collected at the rate of 5% of the primary samples. All sample locations will be surveyed using global positioning system (GPS).

The following soil sampling descriptions are divided into three subcategories (post-excavation confirmation sampling, focused soil sampling, and additional data gap sampling) to better clarify the three different objectives and their different respective analytical approaches. The proposed IM soil sampling locations are shown on **Figures 7** and **9.** Specific rationale and analytical suites for all proposed soil sampling are presented in **Tables VII** and **VIII**, and are summarized here.

2.2.1 Post-Excavation Confirmation Sampling

Post-excavation sampling at Excavations A' through C' will be collected to confirm the removal of dioxins, chromium, and other chemicals per IM goals. Samples will be collected at evenly spaced intervals forming a grid of one sample per approximately 2,500 ft^2 along the base of the excavation. If 50 x 50 foot grid spacing is not practical due to the configuration of the excavation, then one sample will be collected every 50 to 100 feet along the excavation floor. The lateral extent of impacted soil and the effectiveness of the proposed excavation boundaries will be best evaluated based on the focused soil sampling approach discussed below (see Section 2.2.2) and limited side-wall sampling as appropriate. Specific targeted locations for post-excavation sampling will include the following:

- Excavation A'. Samples will be collected at the base of the excavation, depending on final excavation depth, and will include one sample positioned directly below the center of Earth Pond 2.

- Excavation B'. Samples will be collected at the base of the excavation, depending on final excavation depth, and will include one sample positioned directly below historical sample location RR-8.

- Excavation C'. Samples will collected at the base of the excavation, depending on final excavation depth, and will include samples collected directly below former Concrete Ponds 2 and 3.

If excavation is advanced into weathered bedrock, confirmation samples will be collected from weathered bedrock. If excavation is advanced into competent or unweathered bedrock, then no bedrock samples will be collected. Bedrock samples will only be collected in areas with VOCs contamination. Detailed descriptions of post-excavation confirmation samples, including proposed analytical methods and rationale, are presented in **Table VII.**

2.2.2 Focused Soil Sampling

Focused IM soil sampling will serve to delineate the lateral and vertical extent of dioxins, chromium, and other chemicals in the general targeted investigation areas A through E (**Figure 9**). The targeted sampling locations and the scope of the analytical suites (**Table VIII**) are specifically aimed at characterizing the extent of impacted soil in areas of elevated chemicals. Analytical results from this subcategory of sampling will help determine if further IM removal actions are warranted to achieve the IM clean-up goals discussed in Section 2.1.1.

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The focused soil sampling locations are depicted on **Figure 9**. Sample locations are spaced at intervals of approximately 50 to 100 feet around known impacted areas within Investigation Areas A, B, and C and also address draft DTSC comments (DTSC, 2005) for the *Supplemental Soil Sampling Plan for the Thermal Treatment Facility (TTF) and Area I Burn Pit-Solid Waste Management Unit (SWMU) 4.8* (Haley & Aldrich, 2005a). In addition, sample locations target key SWMU features, former geophysical anomalies, and key surface drainages. Soil vapor screening locations are targeted at the above-mentioned locations as well as those discussed in Section 2.2.3. Detailed descriptions of the focused soil samples, including proposed analytical methods and rationale, are presented in **Table VIII**.

Soil samples will be collected near the perimeter of the TTF Interim Status Facility to address known data gaps that are critical to the completion of the RFI program. Focused soil sampling will serve to delineate the lateral and vertical extent of chemicals in soil near the TTF Interim Status Facility. The focused soil sampling locations are depicted on **Figure 9**, and detailed descriptions of the soil samples, including proposed analytical methods and rationale, are presented in **Table VIII**.

2.2.3 Additional Data Gap Sampling and Exploratory Trenching

Additional soil samples will be collected to address known data gaps that are not targeted by the focused soil sampling discussed in Section 2.2.2 but are critical to the completion of the RFI program. The targeted sampling locations and the scope of the analytical suites (**Table VIII**) are specifically aimed at screening and characterizing areas that represent gaps in analytical data within and around the SWMU. Sediment samples will be collected to the southwest and south of the SWMU to characterize drainage sediment near and down slope of the SWMU and CTL-5 (located northwest of the SWMU) (**Figures 7** and **9**). Detailed descriptions of the data gap samples, including proposed analytical methods and rationale, are presented in **Table VIII.** Additional sampling may be necessary to further characterize the data gap areas of the SWMU and will be used in the RFI.

Proposed exploratory trenches outlined in the *Supplemental Soil Sampling Plan for the Thermal Treatment Facility (TTF) and Area I Burn Pit-Solid Waste Management Unit (SWMU) 4.8* (Haley & Aldrich, 2005a) will be included in the IM activities with the exception of those within proposed IM excavation areas. Exploratory trenches are proposed for hummocky areas northwest of and east of the SWMU and the potentially disturbed area northeast of the SWMU (**Figure 9**; **Table VIII**). The depth of trenching will be to bedrock or the maximum depth possible with excavating equipment, and lateral extents will be guided by visual field evidence such as staining and debris. Representative exploration trenches will be excavated if warranted by observed field conditions. Site personnel are prohibited from entering exploratory trenches that are four feet deep or greater, as per the Site-specific Health and Safety Plan.

Northern California Permitting and Corrective Action Branch of DTSC (NCPCAB) shall approve exploratory trench locations, observe exploratory trenches, review analytical results, and provide approval before trench backfilling will occur. The total in-situ volume of soil from the proposed exploratory trenches is anticipated to range from approximately 600 to 1,000 cubic yards. Excavated soil will be handled as discussed in Section 2.1.6. If excavated soil meets the IM clean-up goals and is not

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characterized as hazardous waste, the soil will be used as backfill material, with concurrence by NCPCAB. All metal, glass, wood, or other debris will be shipped as waste or recycled. If it is determined by NCPCAB to be inappropriate to backfill exploratory trenches with excavated soil, then imported or onsite borrow soil or crushed rock may be used for fill material, pending approval by NCPCAB.

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3. CONTINGENCY MEASURES

As indicated above, supplemental soil sampling and analysis will be performed as part of the proposed interim measures. Contingent interim measures may include step-out sampling to determine lateral extents of elevated concentrations of chemicals and additional exploratory trenching in areas adjacent to the SWMU. All Phase II sampling results will be evaluated after the IM activities. All detected chemicals not directly targeted by the IM clean-up goals will be evaluated in the RFI. Upon request by DTSC, detected contaminants not targeted by IM clean-up goals will be stabilized by BMPs to minimize potential migration. If confirmation sample results exceed IM clean-up goals, then additional excavation may be completed to prevent migration of elevated concentrations of dioxins and chromium. Upon approval by DTSC, additional excavation or the implementation of BMPs will be performed. Following review of IM sampling analytical data, and with concurrence by DTSC, additional excavation, if warranted, will be addressed in an interim measures addendum.

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4. INTERIM MEASURES SCHEDULE AND REPORTING

Interim measures proposed in this work plan will be performed following DTSC approval of this work plan and after necessary permits are obtained. Phase I activities are anticipated to require approximately four weeks to complete, and Phase II activities are expected to require approximately four weeks. Analytical data reports and data validation will likely require a minimum of eight weeks with normal turnaround times of samples. Additional characterization sampling, if necessary, and surveying of excavation and sample locations will be conducted following Phase I and II field activities and review of analytical data. Following completion of the IM, data reporting and validation, a report will be prepared that documents completed field activities and sampling results. Potential risks posed by remaining environmental media on site that are not targeted by the IM will be evaluated in the on-going DTSC-approved RFI program.

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5. SUMMARY

DTSC has requested that Boeing submit an interim measures work plan for removal of impacted soils and sediments as a result of past operations at the SWMU. The purpose of the IM is to remove of the most elevated concentrations of dioxins, chromium, and other co-located chemicals in post-Topanga Fire conditions and to better characterize the SWMU. Evaluation of the TTF Interim Status Facility, which lies within the SWMU, is not included in this work plan but is addressed in the TTF Interim Status Facility Closure Plan. Although data collected during the preparation and implementation of this IM will be shared and utilized for the benefit of the TTF Closure Plan, the SWMU and the nearby areas are the focus of this proposed interim measures work plan.

Historical soil sampling data and recent pre-interim measures sampling data for locations distributed across portions of the SWMU help define the distribution and concentration of chemicals in soils. Analysis of the data indicates three main areas with elevated dioxins, chromium, and other co-located chemicals in surficial soil at the SWMU. These are targeted by interim measures in this work plan, as shown on **Figure 8**, using the following methods:

- Proposed Phase I interim measures includes the removal of elevated dioxins and other known impacted soils in order to reduce potential migration of the most highly-elevated contaminants in soils. Excavated soils will be stockpiled or contained in soil bins pending waste characterization and proper disposal.

- Proposed Phase II interim measures includes post-excavation confirmation sampling as well as focused soil sampling and analysis aimed at 1) delineation of the extent of impacted soil in targeted investigation areas at the SWMU, and 2) addressing additional identified data gaps at and around the SWMU that are critical for the completion of the RFI.

In addition to the above proposed measures, surveying of excavations and sampling locations will be performed using GPS to assist with additional characterization of the SWMU. Data from IM activities will be compiled and included in the RFI Program and will be shared and utilized for the benefit of the TTF Interim Status Facility Closure Plan.

Contingent interim measures have been considered in addition to those proposed above. If other impacted soils are identified during IM activities, additional interim measures may be warranted in order meet the objective of this work plan. Contingent interim measures that may be necessary include step-out sampling to determine lateral extents of impacted soils, and additional exploratory trenching of areas adjacent to the SWMU. Additional soil removal, if warranted, will be addressed in an IM addendum pending approval from the DTSC.

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TABLE I
AREA I BURN PIT (SWMU 4.8) ANALYTICAL RESULTS
DIOXINS IN SOIL SAMPLES, APRIL 2005
BOEING SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

Sample Identifier	SB_TTFD-1_0-0.5	SB_TTFD-2_0-0.5	SB_TTFD-3_0-0.5	SB_TTFD-4_0-0.5	SB_TTFD-5_0-0.5	SB_TTFD-6_0-0.5
Sample Date	04/14/05	04/14/05	04/14/05	04/14/05	04/14/05	04/14/05
Sample Type	Primary Sample	Primary Sample	Primary Sample	Primary Sample	Primary Sample	Primary Sample
Analysis Method	8290	8290	8290	8290	8290	8290
Laboratory	DMA	DMA	DMA	DMA	STL-SA	STL-SA
Compound (pg/g)						
1,2,3,4,6,7,8-HpCDD	151000	9180 B	67800	4790 B	140	170
1,2,3,4,6,7,8-HpCDF	11900 B	569 B	4900 B	300 B	19	14 Ja
1,2,3,4,7,8,9-HpCDF	1570 B	48.1 B	493 B	34.4 B	3.1 J	1.0 U
1,2,3,4,7,8-HxCDD	3500	135	1080	68.3	2.3 U	3.9 J
1,2,3,4,7,8-HxCDF	735 B	22.5 B	204 B	18.4 B	6.4	2.1 U
1,2,3,6,7,8-HxCDD	7280	297	2420	180	6.1	7.7
1,2,3,6,7,8-HxCDF	852 J,B	25.5 J,B	240 J	19.3 J,B	2.8 J	1.3 U
1,2,3,7,8,9-HxCDD	4740	221	1690	119	5.0 J	9.8
1,2,3,7,8,9-HxCDF	212 B	5.01 B	52.9	5.04 B	0.57 U	0.36 U
1,2,3,7,8-PeCDD	1450	48.2	401	28.3	1.2 U	2.1 U
1,2,3,7,8-PeCDF	138 B	4.64 B	33.5 B	3.73 B	0.73 U	1.4 U
2,3,4,6,7,8-HxCDF	1080 B	27.6 B	290 B	20.4 B	1.8 U	1.2 U
2,3,4,7,8-PeCDF	193	6.69	47.4	5.86	3.4 J	2.5 U
2,3,7,8-TCDD	96.1	3.82	26	1.7	0.47 U	0.35 U
2,3,7,8-TCDF	1.97 J	1.47	7.06	1.45	1.1 CON, Ja	2.5 CON
OCDD	819000 J	95100	453000	65200	1100	1500
OCDF	29100 B	2130 B	14700 B	903 B	42	31
Total HpCDD	258000	17300 B	120000	8850 B	280	410
Total HpCDF	50500 B	2630 B	21500 B	1280 B	65	41
Total HxCDD	39900	1850	14800	934	36	69
Total HxCDF	23000 J,B	843 J,B	7770 J,B	510 J,B	32	14
Total PeCDD	4210	148	1200	77.7	1.5 U	2.1 U
Total PeCDF	5970 J,B	198 J,B	1460 J,B	117 J,B	17	8.7
Total TCDD	340	14.4	87.7	8.26	0.47 U	0.86
Total TCDF	1270 J	87.7 J	266 J	51.1 J	14	17
2,3,7,8-TCDD TEQ	5257.4	290.21	2049.9	179.5	8.18	8.99

See last page of Table I for notes and abbreviations.

TABLE I
NOTES AND ABBREVIATIONS

DMA	=	Del Mar Analytical of Irvine, California.
STL-SA	=	Severn Trent Laboratories of Sacramento, California
B	=	Estimated value (compound was detected in method blank)
CON	=	Confirmation analysis
Ja	=	The analyte was positively identified, but the quantitation is an estimate.
J	=	Estimated value
U	=	Not detected

TABLE II
AREA I BURN PIT (SWMU 4.8) PRE-INTERIM MEASURES
SUMMARY OF SOIL SAMPLE ANALYSIS, 2006
BOEING SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

Sample Identifier	TTBS15S01, TTLS15S01*	TTBS17S01, TTLS17S01*	TTBS19S01, TTLS19S01*	TTBS20S01, TTLS20S01*	TTBS22S01, TTLS22S01*	TTBS23S01, TTLS23S01*	TTBS24S01, TTLS24S01*	TTBS25S01, TTLS25S01*
Sample Date	2/21/2006	2/23/2006	2/23/2006	2/23/2006	2/23/2006	2/23/2006	2/23/2006	2/23/2006
Sample Type	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Analyses Performed	6010B	6010B	6010B	314.0 MOD.	6010B	6010B	6010B	6010B
	6020	6020	6020	1613	6020	6020	6020	6020
	7471A	7471A	7471A		7471A	7471A	7471A	7471A
	314.0 MOD.	314.0 MOD.	314.0 MOD.		314.0 MOD.	314.0 MOD.	314.0 MOD.	314.0 MOD.
		1613					1613	1613
							8270C SIM	8270C SIM

* Co-located leachate sample for perchorate analysis.

See last page of Table II for notes and abbreviations.

TABLE II
AREA I BURN PIT (SWMU 4.8) PRE-INTERIM MEASURES
SUMMARY OF SOIL SAMPLE ANALYSIS, 2006
BOEING SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

Sample Identifier	TTBS26S01, TTLS26S01*	TTBS27S01, TTLS27S01*	TTBS28S01, TTLS28S01*	TTBS29S01, TTLS29S01*	TTBS30S01, TTLS30S01*	TTBS31S01	TTBS32S01	TTBS33S01
Sample Date	2/23/2006	2/24/2006	2/24/2006	2/24/2006	2/24/2006	2/24/2006	2/24/2006	2/24/2006
Sample Type	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Analyses Performed	314.0 MOD. 1613	6010B 6020 7471A 314.0 MOD.	6010B 6020 7471A 314.0 MOD.	6010B 6020 7471A 314.0 MOD. 1613	6010B 6020 7471A 314.0 MOD.	1613	1613 8270C SIM	6010B 6020 7471A

* Co-located leachate sa* Co-located leachate sample for perchorate analysis.

See last page of Table II for notes and abbreviations.
Haley & Aldrich, Inc.
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TABLE II

NOTES AND ABBREVIATIONS:

*	=	Co-located leachate sample for perchorate analysis.
6010B	=	EPA method 6010B for aluminum and boron.
6020	=	EPA method 6020 for metals.
7471A	=	EPA method 7471A for mercury.
314.0 MOD.	=	EPA method 314.0 MOD modified for perchlorate.
1613	=	EPA method 1613 for dioxins.
8270C SIM	=	EPA method 8270C SIM for polycyclic aromatic hydrocarbons (PAHs).

TABLE III
AREA I BURN PIT (SWMU 4.8) PRE-INTERIM MEASURES ANALYTICAL RESULTS
METALS IN SOIL SAMPLES, FEBRUARY 2006
BOEING SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

Sample Identifier			TTBS15S01	TTBS17S01	TTBS19S01	TTBS22S01	TTBS23S01	TTBS24S01	TTBS25S01	TTBS27S01
Sample Date			02/21/06	02/23/06	02/23/06	02/23/06	02/23/06	02/23/06	02/23/06	02/24/06
Sample Type			Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Laboratory			DMA	DMA	DMA	DMA	DMA	DMA	DMA	DMA
Analyte	**Units**	**Method**								
Aluminum	mg/kg	6010B	17000	15000	25000	11000	15000	13000	12000	12000
Boron	mg/kg	6010B	7	14	11	6.1	9.5	22	4.8 UJ	7 UJ
Antimony	mg/kg	6020	78	0.046 J	0.36 UJ	0.38 UJ	0.36 UJ	0.35 UJ	0.37 UJ	0.19 UJ
Arsenic	mg/kg	6020	4.3 J	5.4	2.9	3.9	3.4	4.8	3.9	2.7
Barium	mg/kg	6020	78	280	57	60	83	68	71	71
Beryllium	mg/kg	6020	0.64	0.66	0.51	0.52	0.67	0.53	0.62	0.73
Cadmium	mg/kg	6020	0.18 UJ	0.71	0.12	0.23	0.31	0.15	0.053	0.036
Chromium	mg/kg	6020	39	160	49	27	32	17	14	11
Cobalt	mg/kg	6020	7.1	8.5	18	5.1	11	3.1	4.6	4.2
Copper	mg/kg	6020	12	89	17	14	86	12	5.7	5
Lead	mg/kg	6020	9.4	43	4.6	11	24	13	4.8	5
Molybdenum	mg/kg	6020	2.7 J	29	0.47	2	3.6	1.5	0.4	0.35
Nickel	mg/kg	6020	62	660	56	49	19	8.2	9.1	6.9
Selenium	mg/kg	6020	0.33 UJ	1.3 UJ	1.4 UJ	1.3 UJ	1.3 UJ	1.3 UJ	1.3 UJ	0.21 U
Silver	mg/kg	6020	0.17	1.2	0.074	0.27	0.13	0.033	0.037	0.027
Thallium	mg/kg	6020	0.36	0.2	0.13	0.18	0.18	0.21	0.23	0.27
Vanadium	mg/kg	6020	36	27	60	24	27	27	26	22
Zinc	mg/kg	6020	42	130	46	66	160	57	37	38
Mercury	mg/kg	7471A	0.064	0.083	0.1	0.17	0.054	0.0063 UJ	0.0058 UJ	0.0073

See last page of Table III for notes and abbreviations.

TABLE III
AREA I BURN PIT (SWMU 4.8) PRE-INTERIM MEASURES ANALYTICAL RESULTS
METALS IN SOIL SAMPLES, FEBRUARY 2006
BOEING SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

Sample Identifier			TTBS28S01	TTBS29S01	TTBS30S01	TTBS33S01	**SRAM**
Sample Date			02/24/06	02/24/06	02/24/06	02/24/06	**Background**
Sample Type			Primary	Primary	Primary	Primary	**Levels**
Laboratory			DMA	DMA	DMA	DMA	
Analyte	**Units**	**Method**					
Aluminum	mg/kg	6010B	10000	15000	16000	10000	20000
Boron	mg/kg	6010B	4.9 UJ	6.5 UJ	6.2 UJ	6.6 UJ	9.7
Antimony	mg/kg	6020	0.19 UJ	0.092 UJ	0.088 UJ	0.092 UJ	8.7
Arsenic	mg/kg	6020	3.1	3.6	4.7	5.6	15
Barium	mg/kg	6020	60	73	75	65	140
Beryllium	mg/kg	6020	0.55	0.64	0.76	0.68	1.1
Cadmium	mg/kg	6020	0.057	0.088	0.069	0.099	1
Chromium	mg/kg	6020	12	15	16	15	37
Cobalt	mg/kg	6020	4.2	5.1	5.2	5.3	21
Copper	mg/kg	6020	5.7	8.5	9.3	8.1	29
Lead	mg/kg	6020	4.7	5.8	6.5	12	34
Molybdenum	mg/kg	6020	0.45	0.44	0.46	0.44	5.3
Nickel	mg/kg	6020	7.6	10	11	10	29
Selenium	mg/kg	6020	0.21 U	0.72 U	0.72 U	0.76 U	0.655
Silver	mg/kg	6020	0.038	0.045	0.055	0.055	0.79
Thallium	mg/kg	6020	0.29	0.28	0.26	0.22	0.46
Vanadium	mg/kg	6020	21	26	28	28	62
Zinc	mg/kg	6020	34	44	45	43	110
Mercury	mg/kg	7471A	0.0078	0.0033 U	0.0055	0.014	0.09

See last page of Table III for notes and abbreviations.

TABLE III
NOTES AND ABBREVIATIONS

DMA	=	Del Mar Analytical of Irvine, California
mg/kg	=	milligram per kilogram
B	=	Estimated value (compound was detected in method blank)
J	=	Estimated value
U	=	Not detected
UJ	=	Estimated non detect

TABLE IV
AREA I BURN PIT (SWMU 4.8) PRE-INTERIM MEASURES ANALYTICAL RESULTS
PERCHLORATE IN SOIL LEACHATE SAMPLES, FEBRUARY 2006
BOEING SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

Sample Identifier	Sample Date	Analysis Method	Perchlorate (ug/L)
TTLS15S01	02/21/06	314.0 MOD.	4 U
TTLS17S01	02/23/06	314.0 MOD.	2.5 J
TTLS19S01	02/23/06	314.0 MOD.	2 J
TTLS20S01	02/23/06	314.0 MOD.	4 U
TTLS22S01	02/23/06	314.0 MOD.	4 U
TTLS23S01	02/23/06	314.0 MOD.	4 U
TTLS24S01	02/23/06	314.0 MOD.	360
TTLS25S01	02/23/06	314.0 MOD.	2.1 J
TTLS26S01	02/23/06	314.0 MOD.	0.85 J
TTLS27S01	02/24/06	314.0 MOD.	4 U
TTLS28S01	02/24/06	314.0 MOD.	4 U
TTLS29S01	02/24/06	314.0 MOD.	4 U
TTLS30S01	02/24/06	314.0 MOD.	4 U

NOTES AND ABBREVIATIONS:
J = estimated value
U = not detected
ug/L = micrograms per liter
314.0 MOD. = EPA method 314.0 MOD modified for perchlorate.
Perchlorate analyses were performed on soil leachate samples.

TABLE V
AREA I BURN PIT (SWMU 4.8) PRE-INTERIM MEASURES ANALYTICAL RESULTS
DIOXINS IN SOIL SAMPLES, FEBRUARY 2006
BOEING SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

Sample Identifier	TTBS17S01	TTBS20S01	TTBS24S01	TTBS25S01	TTBS26S01	TTBS29S01	TTBS31S01	TTBS32S01
Sample Date	02/23/06	02/23/06	02/23/06	02/23/06	02/23/06	02/24/06	02/24/06	02/24/06
Sample Type	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Analysis Method	1613	1613	1613	1613	1613	1613	1613	1613
Laboratory	DMA	DMA	DMA	DMA	DMA	DMA	DMA	DMA
Compound (pg/g)								
1,2,3,4,6,7,8-HpCDD	899	56.7	55.3	0.32 J	40.2	0.226 U	1,020	240
1,2,3,4,6,7,8-HpCDF	109	8.29	103	0.127 U	8.01	0.0863 U	64.2	18.2
1,2,3,4,7,8,9-HpCDF	10.3	1.05 J	12.1	0.0874 U	1.05 J	0.103 U	4.95	1.69 J
1,2,3,4,7,8-HxCDD	10.5	0.731 J	3.14	0.134 U	0.758 J	0.16 U	11.1	2.89
1,2,3,4,7,8-HxCDF	33	3.07	26.2	0.0579 U	2.86	0.0342 U	2.19 J	1.68 J
1,2,3,6,7,8-HxCDD	32.9	2.88	6.23	0.145 U	2.03 J	0.173 U	27.9	7.41
1,2,3,6,7,8-HxCDF	25.7	1.99 J	21.8	0.0537 U	2.13 J	0.0306 U	2.27 J	1.3 J
1,2,3,7,8,9-HxCDD	25.5	1.75 J	4.89	0.132 U	1.51 J	0.159 U	20.4	5.27
1,2,3,7,8,9-HxCDF	7.17	0.644 J	8.29	0.0806 U	0.763 J	0.0457 U	0.701 J	0.485 J
1,2,3,7,8-PeCDD	9.07	0.55 J	2.7	0.072 U	0.579 J	0.0813 U	4.09	1.28 J
1,2,3,7,8-PeCDF	20.9	2.85	9.84	0.105 U	1.74 J	0.0964 U	0.374 J	0.455 J
2,3,4,6,7,8-HxCDF	28	1.78 J	25.3	0.058 U	2.03 J	0.0343 U	3.03	1.84 J
2,3,4,7,8-PeCDF	35.9	2.88	19.5	0.105 U	3.61	0.0911 U	1.46 J	2.02 J
2,3,7,8-TCDD	2.53	0.126 UJ	0.727	0.0724 U	0.13 UJ	0.0934 U	0.361 J	0.141 UJ
2,3,7,8-TCDF	22.7	3.38	5.42	0.0903 U	2.17	0.0855 U	0.275 J	0.948 J
OCDD	6,900	506	148	2.24 J	360	1.15 UJ	11,400	2,310
OCDF	198	15	67.1	0.148 UJ	11.9	0.253 U	217	54.7
Total HpCDD	1,720	118	113	0.637	81.3	0.226 U	1,910	459
Total HpCDF	269	23.4	165	0.145 U	21.3	0.0941 U	315	78.7
Total HxCDD	381	26.5	117	0.137 U	18.8	0.165 U	194	57.8
Total HxCDF	271	21.5	233	0.0617 U	26.1	0.0359 U	84.6	32.4
Total PeCDD	151	7.29	76.9	0.072 U	8.14	0.0813 U	16.2	7.79
Total PeCDF	343	32.1	222	0.105 U	31.5	0.0937 U	21.5	20.2
Total TCDD	110	4.73	52.9	0.0724 U	5.83	0.0934 U	2.13	2.6
Total TCDF	448	41.6	211	0.0903 U	33.7	0.0855 U	8.65	13.3
2,3,7,8-TCDD TEQ	60.03	4.47	25.52	0*	4.43	0*	24.04	7.33

NOTE AND ABBREVIATIONS:
DMA = Del Mar Analytical of Irvine, California
pg/g = picogram/gram
J = estimated value
U = not detected
UJ = estimated non detect
* = Zero TEQs is reported in validated data due to OCDD detection in both soil and blank samples.

TABLE VI

AREA I BURN PIT (SWMU 4.8) PRE-INTERIM MEASURES ANALYTICAL RESULTS
POLYCYCLIC AROMATIC HYDROCARBONS IN SOIL SAMPLES, FEBRUARY 2006
BOEING SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

Sample Identifier	TTBS24S01	TTBS25S01	TTBS32S01
Sample Date	02/23/06	02/23/06	02/24/06
Sample Type	Primary	Primary	Primary
Analysis Method	8270C SIM	8270C SIM	8270C SIM
Laboratory	DMA	DMA	DMA
Compound (mg/kg)			
1-Methylnaphthalene	0.022 U	0.021 U	0.022 U
2-Methylnaphthalene	0.0045 J	0.021 U	0.022 U
Acenaphthene	0.022 U	0.021 U	0.022 U
Acenaphthylene	0.022 U	0.021 U	0.022 U
Anthracene	0.022 U	0.021 U	0.022 U
Benzo(a)anthracene	0.022 U	0.021 U	0.0046 U
Benzo(a)pyrene	0.0034 J	0.021 U	0.022 U
Benzo(b)fluoranthene	0.022 UJ	0.021 UJ	0.0017 J
Benzo(g,h,i)perylene	0.022 U	0.021 U	0.022 U
Benzo(k)fluoranthene	0.022 U	0.021 U	0.022 U
Chrysene	0.022 U	0.021 U	0.022 U
Dibenzo(a,h)anthracene	0.022 UJ	0.021 UJ	0.022 UJ
Fluoranthene	0.0023 J	0.021 U	0.0025 J
Fluorene	0.022 U	0.021 U	0.022 U
Indeno(1,2,3-cd)pyrene	0.022 UJ	0.021 UJ	0.022 UJ
Naphthalene	0.022 U	0.021 U	0.022 U
Phenanthrene	0.022 U	0.021 U	0.022 U
Pyrene	0.022 U	0.0043 J	0.022 U

NOTES AND ABBREVIATIONS:
DMA = Del Mar Analytical of Irvine, California
SIM = selected ion monitoring
mg/kg = milligram/kilogram
J = estimated value
U = not detected
UJ = estimated non detect

TABLE VII
SUMMARY OF PROPOSED POST-EXCAVATION CONFIRMATION SAMPLING (IM PHASE II)
THERMAL TREATMENT FACILITY
BOEING SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

Number of Sample Locations	Area (SEE FIGURE 9)	Matrix	Number of Samples	Analysis	Proposed Sampling Approach	Rationale	Suite: SVOCs	Formaldehyde	Metals	TPH - diesel and oil range	Perchlorate	Fluoride	pH	PCBs - HOLD	Dioxins	PAHs	Total Chromium	Hex. Chromium (HOLD)
	Excavation A'																	
1	Earth Pond 2	soil*	1	suite, dioxins	Collect sample from the base of the excavation just above bedrock or in weathered bedrock if encountered.	Confirmation of removal of impacted soil directly below Earth Pond 2 based on IM cleanup goals.	1	1	1	1	1	1	1	1	1			
6	Approximately every 2500 ft^2 or every 50 linear feet in a narrow excavation.	soil*	6	suite, dioxins	Collect sample from the base of the excavation just above bedrock or in weathered bedrock if encountered.	Confirmation of removal of impacted and/or potentially impacted soil at base of Excavation A' based on IM cleanup goals.	6	6	6	6	6	6	6	6	6			
	Excavation B'																	
1	RR-8	soil*	1	metals, total chromium, hexavalent chromium, perchlorate, dioxins, PAHs	Collect sample from the base of the excavation just above bedrock or in weathered bedrock if encountered.	Confirmation of removal of impacted soil directly below sample location RR-8 based on IM cleanup goals.			1		1				1	1	1	1
2	Two locations distributed to provide areal coverage of the excavation.	soil*	2	metals, total chromium, hexavalent chromium, perchlorate, dioxins, PAHs	Collect sample from the base of the excavation just above bedrock or in weathered bedrock if encountered.	Confirmation of removal of impacted and/or potentially impacted soil at base of Excavation B' based on IM cleanup goals.			2		2				2	2	2	2
	Excavation C'																	
2	Concrete Ponds 2 and 3	soil*	2	suite, dioxins	Collect sample from the base of the excavation just above bedrock or in weathered bedrock if encountered.	Confirmation of removal of impacted soil directly below former Concrete Ponds 2 and 3 based on IM cleanup goals.	2	2	2	2	2	2	2	2	2			
7	Approximately every 2500 ft^2 or every 50 linear feet in a narrow excavation.	soil*	7	suite, dioxins	Collect sample from the base of the excavation just above bedrock or in weathered bedrock if encountered.	Confirmation of removal of impacted and/or potentially impacted soil at base of Excavation C' based on IM cleanup goals.	7	7	7	7	7	7	7	7	7			
						ESTIMATED TOTALS	16	16	19	16	19	16	16	16	19	3	3	3

NOTES:
1. Phase II post-excavation confirmation sample locations will be based on field conditions, and are therefore not located on **Figure 9**.
2. Suite = Semi-volatile organic compounds (SVOCs), formaldehyde, metals, total petroleum hydrocarbons (TPH), perchlorate, fluoride, pH, and polychlorinated biphenyls (PCBs). This suite is based upon chemicals detected in historical soil samples collected at the SWMU.
3. EPA Method Numbers: SVOCs (8270C), formaldehyde (8315), metals (6010B, 6020, 7471A), TPH (8015), perchlorate (314.1), fluoride (300.0), pH (9045), PCBs (8082), dioxins (1613B), PAHs (8270SIM), hydrazine (8315).
4. PCBs will be analyzed in samples containing elevated oil-range TPH (>1000 mg/kg).
5. Samples collected for hexavalent chromium will be held pending the total chromium results. Hexavalent chromium will be run on samples containing elevated total chromium above the background concentration.
6. soil* = The sample may be collected from weathered bedrock depending on the total depth of the excavation.

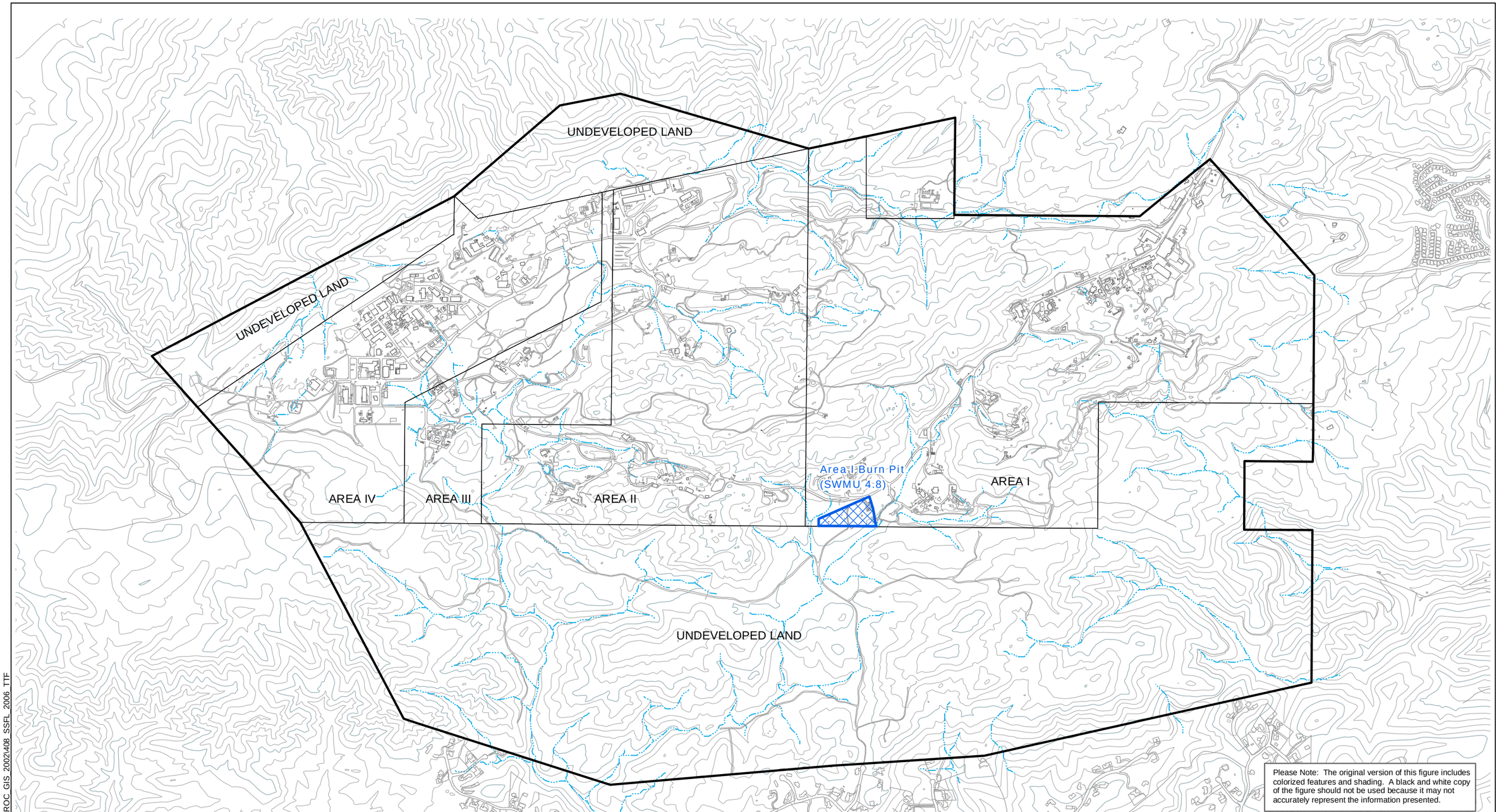
TABLE VIII
SUMMARY OF PROPOSED SOIL SAMPLING (IM PHASE II)
THERMAL TREATMENT FACILITY
BOEING SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

Number of Sample Locations	Area (SEE FIGURE 9)	Matrix	Number of Samples	Analyses	Proposed Sampling Approach	Rationale	Suite: SVOCs	Formaldehyde	Metals	TPH - diesel and oil range	Perchlorate	Fluoride	pH	PCBs (HOLD)	VOCs	VOCs (soil vapor)	Dioxins	PAHs	NDMA	Total Chromium	Hex. Chromium (HOLD)
	Investigation Area A																				
6	Perimeter	soil	12	suite, dioxins	Collect and analyze samples at ground surface and just above bedrock.	Characterize lateral extents of chemical impacts. Depth to bedrock estimated at 2.5 feet.	12	12	12	12	12	12	12	12			12				
2	Earth Pond 1 (exploratory excavation)	soil	2	suite, dioxins	Collect two samples at base of proposed exploratory trench, just above bedrock.	Characterize extents of chemicals within Earth Pond 1.	2	2	2	2	2	2	2	2			2				
2	Earth Pond 2 berm (western side)	soil	2	suite, dioxins	Collect samples at ground surface and 3.5-4.0 on berm.	Characterize the berm of Earth Pond 2	2	2	2	2	2	2	2	2			2				
	Investigation Area B																				
2	Former Fire Demonstration Areas (exploratory trench)	soil	4	metals, total chromium, hexavalent chromium, perchlorate, dioxins, PAHs	Collect and analyze samples at ground surface and just above bedrock. If depth to bedrock is greater than 3 feet, collect and analyze an additional sample at 2 feet below ground surface.	Characterize lateral extents of chemical impacts. Depth to bedrock estimated to vary from 1 - 5 feet.			4		4						4	4		4	4
2	Perimeter (East and West)	soil	4	metals, total chromium, hexavalent chromium, perchlorate, dioxins, PAHs	Collect and analyze samples at ground surface and just above bedrock. If depth to bedrock is greater than 3 feet, collect and analyze an additional sample at 2 feet below ground surface.	Characterize lateral extents of chemical impacts. Depth to bedrock estimated to vary from 1 - 5 feet.			4		4						4	4		4	4
2	Perimeter (North and South)	soil	0 to 4	metals, total chromium, hexavalent chromium, perchlorate, dioxins, PAHs	Collect and **hold** samples at ground surface and just above bedrock. If depth to bedrock is greater than 3 feet, collect and hold an additional sample at 2 feet below ground surface. Analyze hold samples if impacts are detected in samples from Former Fire Demo Areas.	Step-out samples to characterize lateral extents if Former Fire Demonstration Area is impacted with chemicals. Depth to bedrock estimated to vary from 1 - 5 feet.			4		4						4	4		4	4
	Investigation Area C																				
11	Perimeter and Geophysical Anomalies Along Perimeter	soil	33	suite, dioxins	Collect and analyze samples at ground surface, 2 feet below ground surface, and just above bedrock.	Characterize lateral extents of chemical impacts. Screen for potential impacts at locations coincident with former geophysical anomalies, historical excavation, and former Control Center. Depth to bedrock estimated to range from 0 to 5 feet.	33	33	33	33	33	33	33	33			33				
4	Center and Immediately North of Earth Pond 3 (within Excavation C)	soil	8	suite, dioxins	If excavation is not to bedrock, collect and analyze samples from bottom of excavation and just above bedrock.	Characterize lateral extents of chemical impacts from Earth Pond 3. Depth to bedrock estimated at 4.5 feet.	8	8	8	8	8	8	8	8			8				
2	South of Earth Pond 3	soil	6	suite, dioxins	Collect and analyze samples at ground surface, 2 feet below ground surface, and just above bedrock.	Characterize lateral extents of chemical impacts from Earth Pond 3. Depth to bedrock estimated at 4.5 feet.	6	6	6	6	6	6	6	6			6				
	South of Investigation Area C																				
2	Geophysical Anomaly Near Well RD-03	soil	4	VOCs, metals, perchlorate, dioxins	Collect samples at ground surface and 2 feet, analyze shallow sample for dioxins and perchlorate, analyze deep sample for VOCs and metals.	Screen for potential chemicals at former geophysical anomoly, and downslope from the anomoly.			4		4				4		4				
2	Drainage / Downslope Samples	soil	2	metals, perchlorate, dioxins	Collect and analyze samples at ground surface.	Screen for potential chemicals along drainage channel and drainage slope at southeastern perimeter of SWMU boundary.			2		2						2				
	Investigation Area D																				
7	Perimeter and Geophysical Anomaly	soil	21	suite, dioxins, NDMA	Collect and analyze samples at ground surface, 5 feet below ground surface, and just above bedrock.	Characterize lateral extents of chemical impacts and screen for potential chemical impacts at former geophysical anomaly. Hydrazine is a chemical based on historical soil data - potential hydrazine impacts will be evaluated by analyzing for NDMA. Depth to bedrock estimated to range from 8 to 11 feet.	21	21	21	21	21	21	21	21			21		21		
	Investigation Area E																				
3	Perimeter North, East, and West of Burn Pit 1	soil	9	suite, dioxins	Collect and analyze samples at ground surface, 5 feet below ground surface, and just above bedrock.	Characterize lateral extents of chemical impacts. Depth to bedrock estimated at 13 feet.	9	9	9	9	9	9	9	9			9				
1	Burn Pit 1	soil	3	suite, dioxins	Collect and analyze samples at ground surface, 5 feet below ground surface, and just above bedrock.	Screen for potential chemical impacts at former Burn Pit 1. Depth to bedrock estimated at 13 feet.	3	3	3	3	3	3	3	3							
	Soil Vapor																				
62	Focused Irregular Grid	vapor	62	VOCs	Collect and analyze soil vapor samples at 3 feet below ground surface at geophysical anomolies and at locations where depth to bedrock is 5 feet or less. Collect and analyze soil vapor samples at 3 feet and at top of bedrock at locations were depth to bedrock is greater than 5 feet.	Screen for VOCs at impacted areas and potentially impacted areas.										62					
	Southwestern Border of the SWMU																				
3	Samples Along Southern SWMU Boundary East of Earth Pond 2	soil	3	suite, dioxins	Collect and analyze samples at ground surface.	Characterize lateral extents of chemical impacts along southwestern border of SWMU.	3	3	3	3	3	3	3	3			3				
	Potentially Disturbed Area																				
5	Potentially disturbed area northeast of the SWMU	soil	10	suite, dioxins, PAHs	Collect and analyze samples from each exploratory trench in potentially disturbed areas northeast of the SWMU. Collect and analyze samples at ground surface and at base of trench. HOLD sample at base of trench if no field evidence of soil impacts.	Screen for potential chemical impacts in potentially disturbed area.	10	10	10	10	10	10	10	10			10	10			

TABLE VIII
SUMMARY OF PROPOSED SOIL SAMPLING (IM PHASE II)
THERMAL TREATMENT FACILITY
BOEING SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

Number of Sample Locations	Area (SEE FIGURE 9)	Matrix	Number of Samples	Analyses	Proposed Sampling Approach	Rationale	Suite: SVOCs	Formaldehyde	Metals	TPH - diesel and oil range	Perchlorate	Fluoride	pH	PCBs (HOLD)	VOCs	VOCs (soil vapor)	Dioxins	PAHs	NDMA	Total Chromium	Hex. Chromium (HOLD)
	Drainage to Perimeter Pond																				
2	Southeast trending drainage to Perimeter Pond.	soil	2	RFI, dioxins	Collect and analyze samples at ground surface.	Screen for potential chemical impacts in drainage.	2		2	2	2			2			2				
	Former Nitrogen Tetroxide Tank																				
1	Former Nitrogen Tetroxide Tank North of Control Center	soil	1	RFI	Collect and analyze samples at ground surface at former tank location.	Screen for potential chemical impacts associated with former tank.	1		1	1	1			1							
	Perimeter of Northern TTF Interim Status Facility																				
4	Perimeter of Northern TTF Interim Status Facility (Burn Pit 2)	soil	12	suite, dioxins	Collect and analyze samples at ground surface and just above bedrock. If depth to bedrock is greater than 5 feet, collect and analyze an additional sample at 2 feet below ground surface.	Provide lateral extents of potential chemical impacts. Estimated depth to bedrock at Burn Pit 2 is approximately 6 feet.	12	12	12	12	12	12	12	12	12		12				
	Perimeter of Southern TTF Interim Status Facility																				
4	Perimeter of Southern TTF Interim Status Facility (Concrete Pad 2)	soil	12	suite, dioxins	Collect and analyze samples at ground surface and just above bedrock. If depth to bedrock is greater than 5 feet, collect and analyze an additional sample at 2 feet below ground surface.	Provide lateral extents of potential chemical impacts. Estimated depth to bedrock at Concrete Pad 2 is approximately 3.5 feet.	12	12	12	12	12	12	12	12	12		12				
	Northeast Hummocks																				
3	Hummocky Terrain Northeast of Excavation C' and Investigation Area C, along and northwest of Perimeter Pond.	soil	6	RFI	Collect and analyze samples at ground surface and at base of each exploratory trench. HOLD sample at base of trench if no field evidence of soil impacts.	Screen for potential chemical impacts in disturbed soil area.	6		6	6	6			6							
	Northwestern Hummocks																				
3	Hummocky Terrain North of Earth Pond 1 and Investigation Area A	soil	6	RFI	Collect and analyze samples at ground surface and at base of each exploratory trench. HOLD sample at base of trench if no field evidence of soil impacts.	Screen for potential chemical impacts in disturbed soil area.	6		6	6	6			6							
	Outlying Geophysical Anomalies																				
3	Three Anomalies North of Excavation B'	soil	3	VOCs, metals, dioxins, and perchlorate	Collect and analyze samples from 2 feet bgs.	Screen for potential chemical impacts at former geophysical anomalies.			3		3				3		3				
2	Two Anomalies East of Excavation C'	soil	2	VOCs, metals, dioxins, and perchlorate	Collect and analyze samples from 2 feet bgs.	Screen for potential chemical impacts at former geophysical anomalies.			2		2				2		2				
1	Anomaly West of Earth Pond 2	soil	1	RFI	Collect and analyze sample at ground surface.	Screen for potential chemical impacts at former geophysical anomalies.	1		1	1	1			1			1				
1	Two Geophysical Anomalies North of Concrete Pad 2	soil	2	VOCs, metals, dioxins, and perchlorate	Collect and analyze samples at ground surface and 2 feet below ground surface.	Screen for potential chemical impacts between tightly clustered former geophysical anomalies. Sample from 0.5 feet below ground surface for dioxins and perchlorate as part of pre-IM sampling.			1		1				1		1				
1	Geophysical anomaly southeast of Concrete Pad 2	soil	2	VOCs, metals, perchlorate, dioxins	Collect samples at ground surface and 2 feet, analyze shallow sample for dioxins and perchlorate, analyze deep sample for VOCs and metals.	Screen for potential chemical impacts at former geophysical anomaly, and in drainage channel.			1		1				1		1				
1	Geophysical anomaly southeast of Investigation Area D	soil	2	VOCs, SVOCs, metals, perchlorate, dioxins	Collect samples at ground surface and 2 feet, analyze shallow sample for SVOCs, metals, dioxins and perchlorate, analyze deep sample for VOCs and metals.	Screen for potential chemical impacts at former geophysical anomaly and drainage slope at southeastern perimeter of SWMU boundary.	1		2		1				1		1				
	Drainage Sediments (SEE FIGURE 7)																				
6	Drainages West and South of SWMU 4.8	soil	6	Dioxins, perchlorate, PCBs, PAHs, and metals	Collect and analyze sediment samples from ground surface along bedrock in drainages.	Screen for and characterize extent of known or potential chemical impacts from western drainage of SWMU 4.8 or from upslope.			6		6			6			6	6			
1	TTBS33, southwest of Earth Pond 1	soil	1	perchlorate, PCBs, and PAHs	Collect and analyze sediment sample from ground surface.	Screen for and characterize extent of known or potential chemical impacts from western drainage of SWMU 4.8 or from upslope.					1			1			1	1			
1	Northwest of Earth Pond 1	soil	1	dioxins, perchlorate, PAHs, and metals	Collect and analyze sediment sample from ground surface.	Screen for and characterize extent of known or potential chemical impacts from western drainage of SWMU 4.8 or from upslope.			1		1						1	1			
						ESTIMATED TOTALS	150	133	183	149	183	133	133	156	36	62	167	30	21	12	12

NOTES:
1. The Phase II Interim Measures sampling listed on this table are shown on Figures 7 and 9, and includes the focused soil sampling to delineate the lateral and vertical extent of dioxins, chromium, and other chemicals in targeted Investigation Areas A through E, and soil sampling locations to address known data gaps in the SWMU related to the RFI report.
2. Suite = Semi-volatile organic compounds (SVOCs), formaldehyde, metals, total petroleum hydrocarbons (TPH), perchlorate, fluoride, pH, polychlorinated biphenyls (PCBs). This suite is based upon chemicals detected in historical soil samples collected at the SWMU.
3. RFI = TPH, SVOCs, metals, PCBs, perchlorate.
4. EPA Method Numbers: SVOCs (8270C), formaldehyde (8315), metals (6010B, 6020, 7471A), TPH (8015), perchlorate (314.1), fluoride (300.0), pH (9045), PCBs (8082), VOCs (8260B), Dioxins (1613B), PAHs (8270SIM), NDMA (8270 SIM).
5. PCBs will be held and analyzed in samples containing elevated oil-range TPH (>1000 mg/kg).
6. Potential hydrazine impacts will be evaluated by analyzing for n-nitrosodimethylamine (NDMA).
7. Samples collected for hexavalent chromium will be held pending the total chromium results. Hexavalent chromium will be run on samples containing elevated total chromium above the background concentration.



Please Note: The original version of this figure includes colorized features and shading. A black and white copy of the figure should not be used because it may not accurately represent the information presented.

Legend

Property Boundary Line

Area I Burn Pit (SWMU 4.8) Boundary

N
W E
S

0 1700 3400
SCALE IN FEET

HALEY & ALDRICH

THE BOEING COMPANY
SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

LOCATION OF THE AREA I
BURN PIT - SWMU 4.8

SCALE: AS SHOWN
JUNE 2006

FIGURE 1

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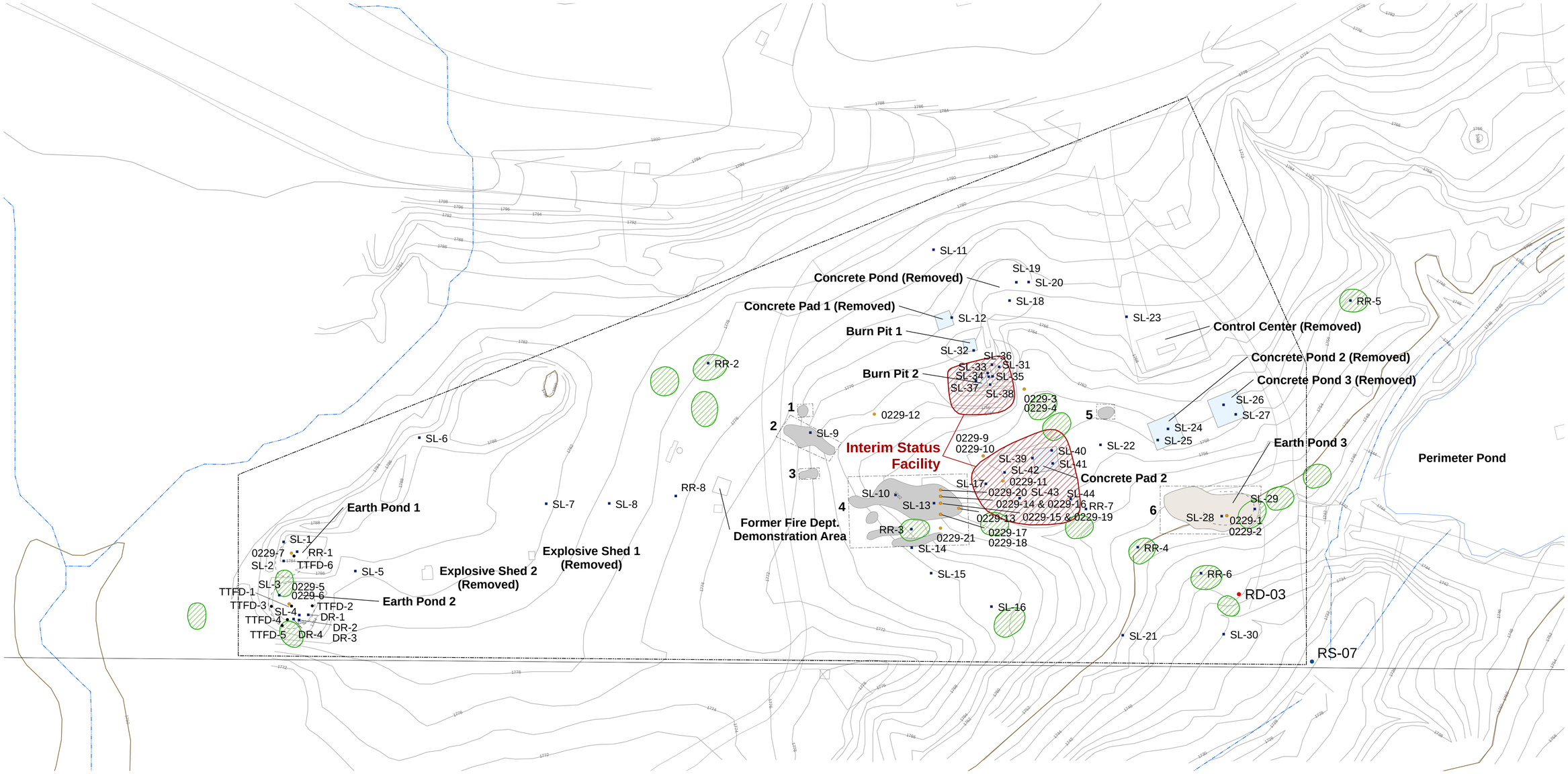

Please Note: The original version of this figure includes colorized features and shading. A black and white copy of the figure should not be used because it may not accurately represent the information presented.

Legend

- Chatsworth Formation Monitoring Well
- Shallow Monitoring Well
- Property Boundary Line
- Streams
- TTF Interim Status Facility (Area addressed in the Interim Status Facility Closure)
- Area of Buried Debris (1981)
- Area of Sediment (1981)
- 1 Excavation Perimeter (1982) With Excavation Number
- Approximate Location Where Anomalies Identified by ICF Kaiser (1993) Were Exhumed
- Former Concrete Ponds/Pads
- Soil Sample Collected by Harding Lawson Associates (1981-1982)
- Soil Sample Collected by GWRC, 1993-1994
- Soil Sample Collected by Haley & Aldrich/DTSC (2005)
- Area I Burn Pit (SWMU 4.8) Boundary
- Earthen Pond

N
W E
S

0 40 80 120 160
SCALE IN FEET

HALEY & ALDRICH

THE BOEING COMPANY
SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

HISTORICAL SOIL SAMPLING LOCATIONS AREA I BURN PIT - SWMU 4.8

SCALE: AS SHOWN
JUNE 2006

FIGURE 2

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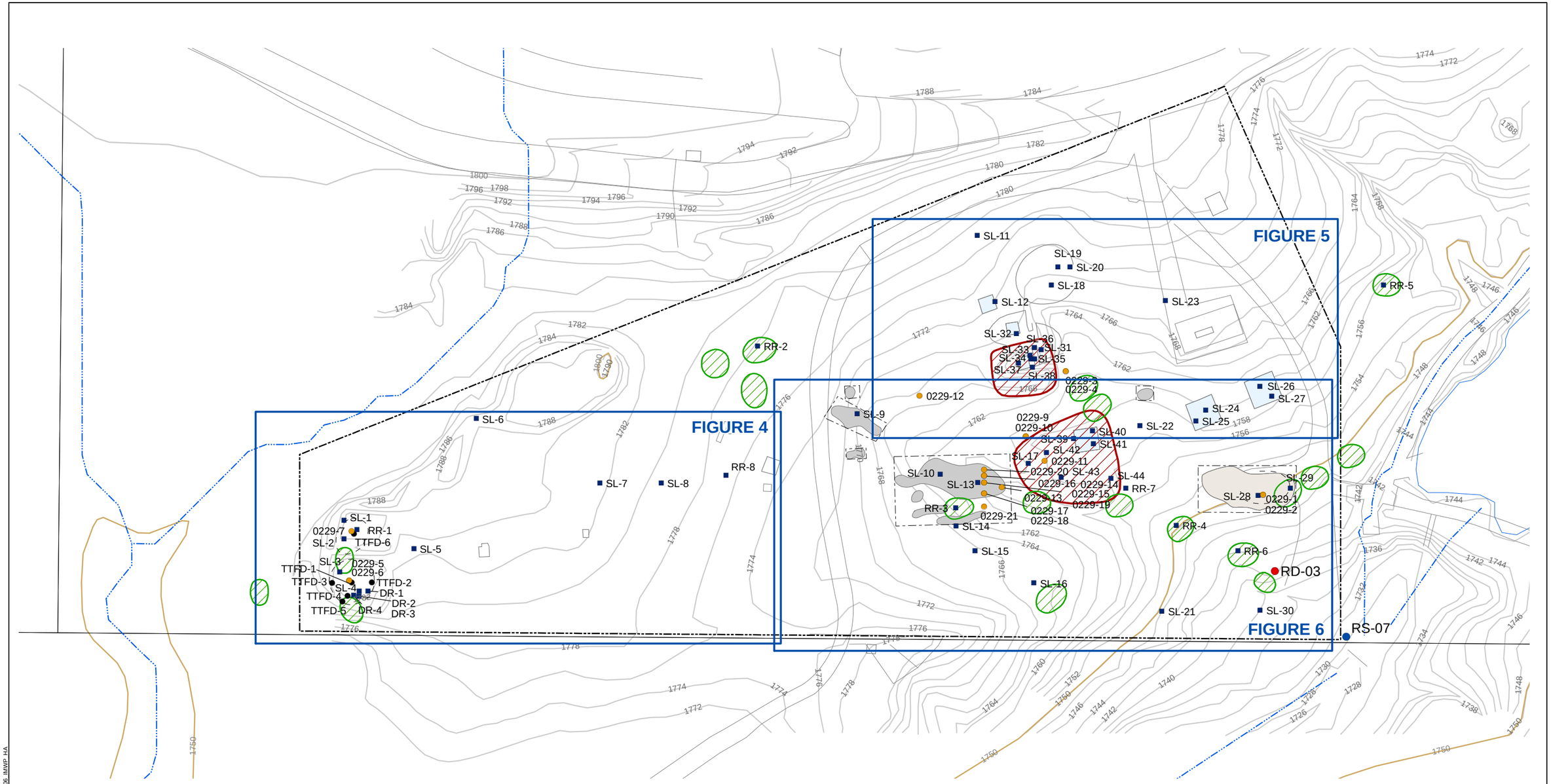

Please Note: The original version of this figure includes colorized features and shading. A black and white copy of the figure should not be used because it may not accurately represent the information presented.

Legend

- Chatsworth Formation Monitoring Well
- Shallow Monitoring Well
- Property Boundary Line
- Streams
- TTF Interim Status Facility (Area addressed in the Interim Status Facility Closure)
- Area I Burn Pit (SWMU 4.8) Boundary
- Earthen Pond
- Former Concrete Ponds/Pads
- Area of Buried Debris (1981)
- Area of Sediment (1981)
- Excavation Perimeter (1982)
- Approximate Location where Anomalies Identified by ICF Kaiser (1993) were Exhumed
- Soil Sample Collected by Harding Lawson Associates (1981-1982)
- Soil Sample Collected by GWRC, 1993-1994
- Soil Sample Collected by Haley & Aldrich/DTSC (2005)

N
W E
S

0 80 160
SCALE IN FEET

HALEY & ALDRICH

THE BOEING COMPANY
SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

KEY TO FIGURES 4, 5 AND 6
AREA I BURN PIT - SWMU 4.8

SCALE: AS SHOWN
JUNE 2006

FIGURE 3

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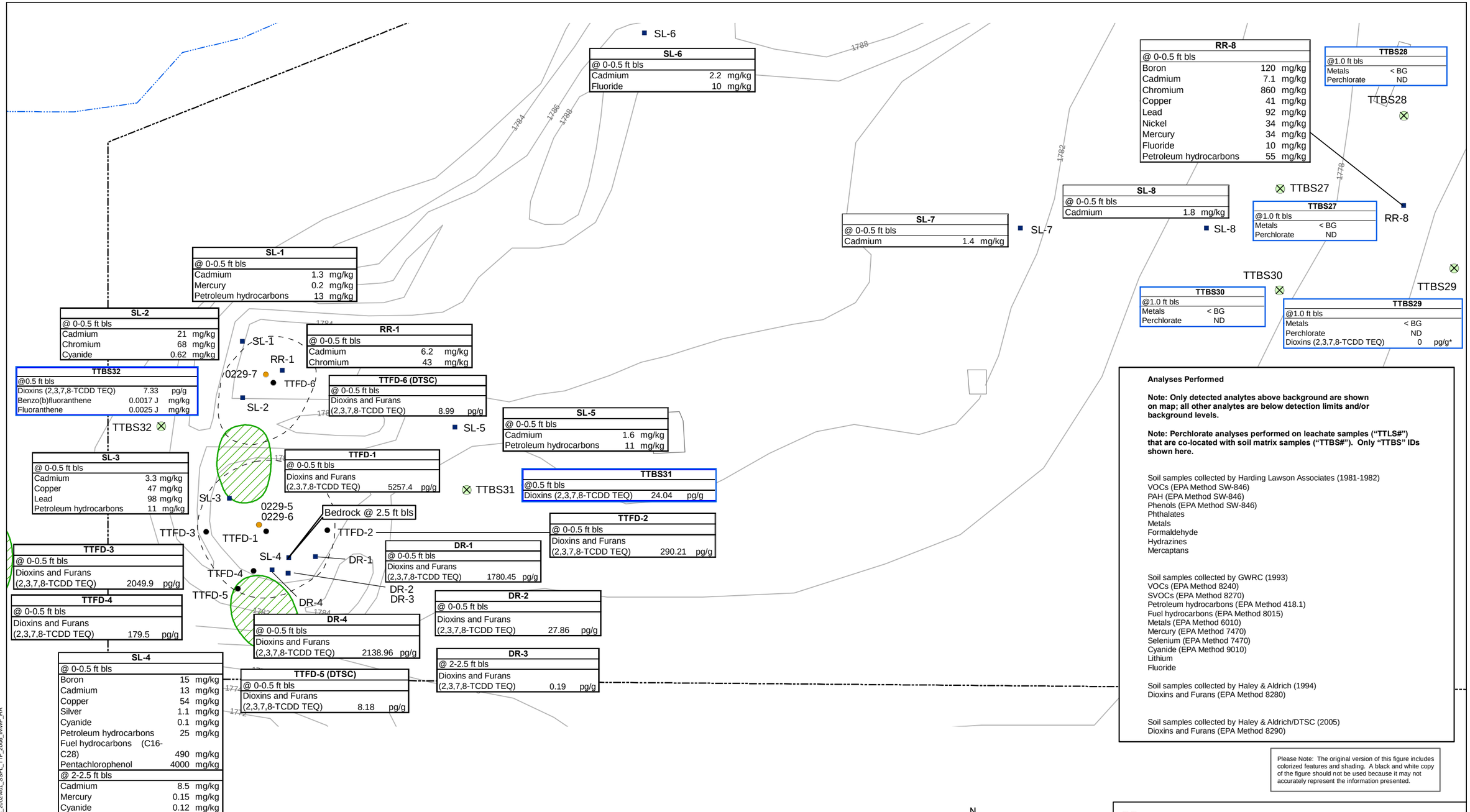

Analyses Performed

Note: Only detected analytes above background are shown on map; all other analytes are below detection limits and/or background levels.

Note: Perchlorate analyses performed on leachate samples ("TTLS#") that are co-located with soil matrix samples ("TTBS#"). Only "TTBS" IDs shown here.

Soil samples collected by Harding Lawson Associates (1981-1982)
VOCs (EPA Method SW-846)
PAH (EPA Method SW-846)
Phenols (EPA Method SW-846)
Phthalates
Metals
Formaldehyde
Hydrazines
Mercaptans

Soil samples collected by GWRC (1993)
VOCs (EPA Method 8240)
SVOCs (EPA Method 8270)
Petroleum hydrocarbons (EPA Method 418.1)
Fuel hydrocarbons (EPA Method 8015)
Metals (EPA Method 6010)
Mercury (EPA Method 7470)
Selenium (EPA Method 7470)
Cyanide (EPA Method 9010)
Lithium
Fluoride

Soil samples collected by Haley & Aldrich (1994)
Dioxins and Furans (EPA Method 8280)

Soil samples collected by Haley & Aldrich/DTSC (2005)
Dioxins and Furans (EPA Method 8290)

Please Note: The original version of this figure includes colorized features and shading. A black and white copy of the figure should not be used because it may not accurately represent the information presented.

Legend

- Chatsworth Formation Monitoring Well
- Shallow Monitoring Well
- Property Boundary Line
- Streams
- Area of Buried Debris (1981)
- Area of Sediment (1981)
- Excavation Perimeter (1982)
- Approximate Location where Anomalies Identified by ICF Kaiser (1993) were Exhumed
- Former Concrete Ponds/Pads
- Soil Sample Collected by Harding Lawson Associates (1981-1982)
- Soil Sample Collected by GWRC, 1993-1994
- Soil Sample Collected by Haley & Aldrich/DTSC (2005)
- Area I Burn Pit (SWMU 4.8) Boundary
- Earthen Pond

SL-32 Soil Sample ID
@ 0-0.5 bls Depth in Feet bls = Below land surface
Copper 33 mg/kg Analyte Concentration Units
TEQ = Total Equivalent

0 pg/g* A TEQ value of zero is reported in validation data due to OCDD detection in both soil and blank samples.

Pre-I.M. Soil Sample Collected by Mongomery Watson-Harza (2006) Sample results shown in blue boxes.

N W E S

0 25 50
SCALE IN FEET

HALEY & ALDRICH

THE BOEING COMPANY
SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

HISTORICAL SOIL SAMPLES WITH ELEVATED CONCENTRATIONS OF ANALYTES - SOUTHWEST AREA AREA I BURN PIT - SWMU 4.8

SCALE: AS SHOWN
JUNE 2006

FIGURE 4

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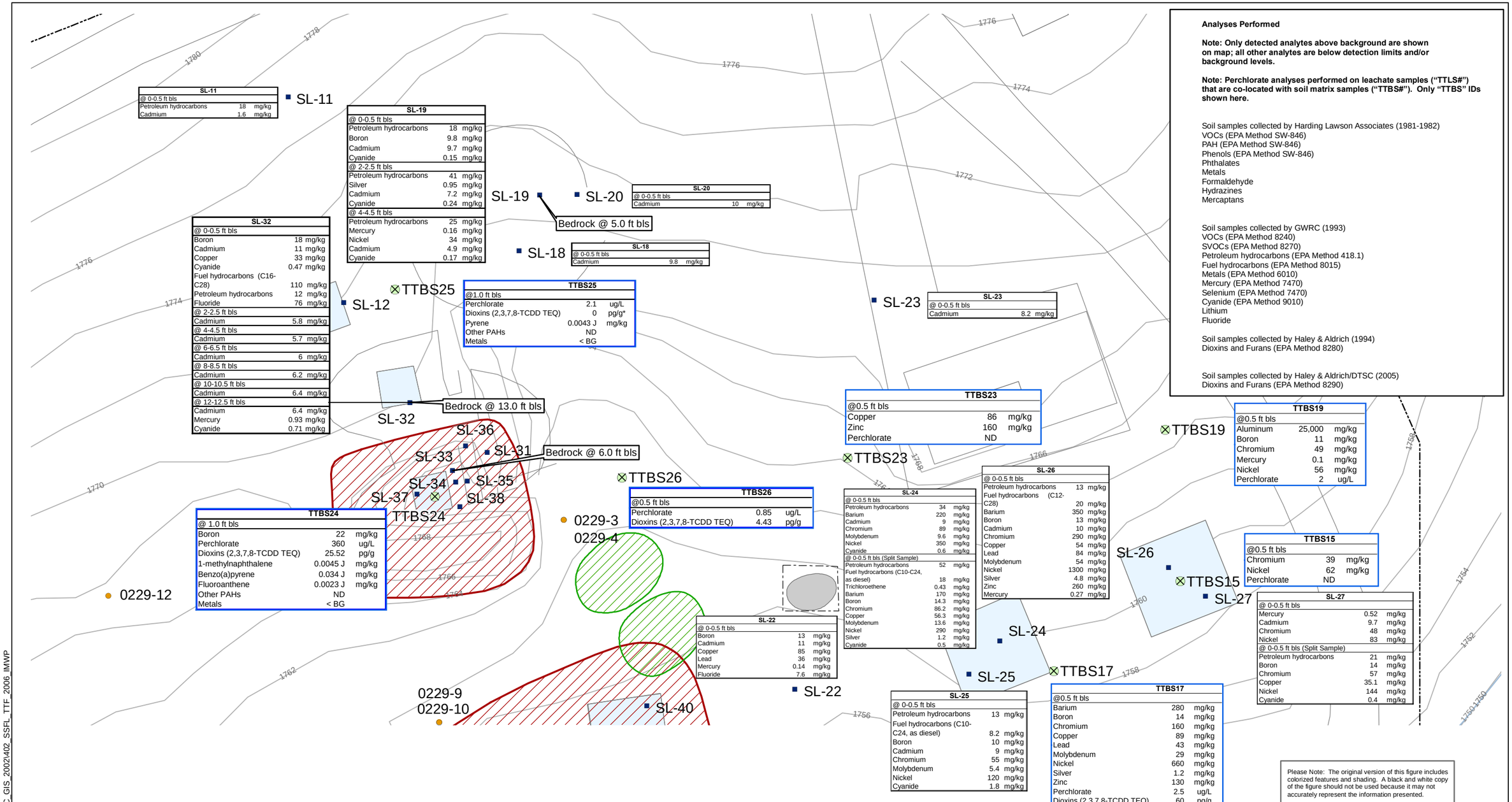

SL-11		
@ 0-0.5 ft bls		
Petroleum hydrocarbons	18	mg/kg
Cadmium	1.6	mg/kg

SL-19		
@ 0-0.5 ft bls		
Petroleum hydrocarbons	18	mg/kg
Boron	9.8	mg/kg
Cadmium	9.7	mg/kg
Cyanide	0.15	mg/kg
@ 2-2.5 ft bls		
Petroleum hydrocarbons	41	mg/kg
Silver	0.95	mg/kg
Cadmium	7.2	mg/kg
Cyanide	0.24	mg/kg
@ 4-4.5 ft bls		
Petroleum hydrocarbons	25	mg/kg
Mercury	0.16	mg/kg
Nickel	34	mg/kg
Cadmium	4.9	mg/kg
Cyanide	0.17	mg/kg

SL-20		
@ 0-0.5 ft bls		
Cadmium	10	mg/kg

SL-18		
@ 0-0.5 ft bls		
Cadmium	9.8	mg/kg

SL-32		
@ 0-0.5 ft bls		
Boron	18	mg/kg
Cadmium	11	mg/kg
Copper	33	mg/kg
Cyanide	0.47	mg/kg
Fuel hydrocarbons (C16-C28)	110	mg/kg
Petroleum hydrocarbons	12	mg/kg
Fluoride	76	mg/kg
@ 2-2.5 ft bls		
Cadmium	5.8	mg/kg
@ 4-4.5 ft bls		
Cadmium	5.7	mg/kg
@ 6-6.5 ft bls		
Cadmium	6	mg/kg
@ 8-8.5 ft bls		
Cadmium	6.2	mg/kg
@ 10-10.5 ft bls		
Cadmium	6.4	mg/kg
@ 12-12.5 ft bls		
Cadmium	6.4	mg/kg
Mercury	0.93	mg/kg
Cyanide	0.71	mg/kg

TTBS25		
@1.0 ft bls		
Perchlorate	2.1	ug/L
Dioxins (2,3,7,8-TCDD TEQ)	0	pg/g*
Pyrene	0.0043 J	mg/kg
Other PAHs	ND	
Metals	< BG	

SL-23		
@ 0-0.5 ft bls		
Cadmium	8.2	mg/kg

TTBS23		
@0.5 ft bls		
Copper	86	mg/kg
Zinc	160	mg/kg
Perchlorate	ND	

TTBS19		
@0.5 ft bls		
Aluminum	25,000	mg/kg
Boron	11	mg/kg
Chromium	49	mg/kg
Mercury	0.1	mg/kg
Nickel	56	mg/kg
Perchlorate	2	ug/L

TTBS26		
@0.5 ft bls		
Perchlorate	0.85	ug/L
Dioxins (2,3,7,8-TCDD TEQ)	4.43	pg/g

SL-24		
@ 0-0.5 ft bls		
Petroleum hydrocarbons	34	mg/kg
Barium	220	mg/kg
Cadmium	9	mg/kg
Chromium	89	mg/kg
Molybdenum	9.6	mg/kg
Nickel	350	mg/kg
Cyanide	0.6	mg/kg
@ 0-0.5 ft bls (Split Sample)		
Petroleum hydrocarbons	52	mg/kg
Fuel hydrocarbons (C10-C24, as diesel)	18	mg/kg
Trichloroethene	0.43	mg/kg
Barium	170	mg/kg
Boron	14.3	mg/kg
Chromium	86.2	mg/kg
Copper	56.3	mg/kg
Molybdenum	13.6	mg/kg
Nickel	290	mg/kg
Silver	1.2	mg/kg
Cyanide	0.5	mg/kg

SL-26		
@ 0-0.5 ft bls		
Petroleum hydrocarbons	13	mg/kg
Fuel hydrocarbons (C12-C28)	20	mg/kg
Barium	350	mg/kg
Boron	13	mg/kg
Cadmium	10	mg/kg
Chromium	290	mg/kg
Copper	54	mg/kg
Lead	84	mg/kg
Molybdenum	54	mg/kg
Nickel	1300	mg/kg
Silver	4.8	mg/kg
Zinc	260	mg/kg
Mercury	0.27	mg/kg

TTBS15		
@0.5 ft bls		
Chromium	39	mg/kg
Nickel	62	mg/kg
Perchlorate	ND	

SL-27		
@ 0-0.5 ft bls		
Mercury	0.52	mg/kg
Cadmium	9.7	mg/kg
Chromium	48	mg/kg
Nickel	83	mg/kg
@ 0-0.5 ft bls (Split Sample)		
Petroleum hydrocarbons	21	mg/kg
Boron	14	mg/kg
Chromium	57	mg/kg
Copper	35.1	mg/kg
Nickel	144	mg/kg
Cyanide	0.4	mg/kg

TTBS24		
@ 1.0 ft bls		
Boron	22	mg/kg
Perchlorate	360	ug/L
Dioxins (2,3,7,8-TCDD TEQ)	25.52	pg/g
1-methylnaphthalene	0.0045 J	mg/kg
Benzo(a)pyrene	0.034 J	mg/kg
Fluoroanthene	0.0023 J	mg/kg
Other PAHs	ND	
Metals	< BG	

SL-22		
@ 0-0.5 ft bls		
Boron	13	mg/kg
Cadmium	11	mg/kg
Copper	85	mg/kg
Lead	36	mg/kg
Mercury	0.14	mg/kg
Fluoride	7.6	mg/kg

SL-25		
@ 0-0.5 ft bls		
Petroleum hydrocarbons	13	mg/kg
Fuel hydrocarbons (C10-C24, as diesel)	8.2	mg/kg
Boron	10	mg/kg
Cadmium	9	mg/kg
Chromium	55	mg/kg
Molybdenum	5.4	mg/kg
Nickel	120	mg/kg
Cyanide	1.8	mg/kg

TTBS17		
@0.5 ft bls		
Barium	280	mg/kg
Boron	14	mg/kg
Chromium	160	mg/kg
Copper	89	mg/kg
Lead	43	mg/kg
Molybdenum	29	mg/kg
Nickel	660	mg/kg
Silver	1.2	mg/kg
Zinc	130	mg/kg
Perchlorate	2.5	ug/L
Dioxins (2,3,7,8-TCDD TEQ)	60	pg/g

Analyses Performed

Note: Only detected analytes above background are shown on map; all other analytes are below detection limits and/or background levels.

Note: Perchlorate analyses performed on leachate samples ("TTLS#") that are co-located with soil matrix samples ("TTBS#"). Only "TTBS" IDs shown here.

Soil samples collected by Harding Lawson Associates (1981-1982)
VOCs (EPA Method SW-846)
PAH (EPA Method SW-846)
Phenols (EPA Method SW-846)
Phthalates
Metals
Formaldehyde
Hydrazines
Mercaptans

Soil samples collected by GWRC (1993)
VOCs (EPA Method 8240)
SVOCs (EPA Method 8270)
Petroleum hydrocarbons (EPA Method 418.1)
Fuel hydrocarbons (EPA Method 8015)
Metals (EPA Method 6010)
Mercury (EPA Method 7470)
Selenium (EPA Method 7470)
Cyanide (EPA Method 9010)
Lithium
Fluoride

Soil samples collected by Haley & Aldrich (1994)
Dioxins and Furans (EPA Method 8280)

Soil samples collected by Haley & Aldrich/DTSC (2005)
Dioxins and Furans (EPA Method 8290)

Please Note: The original version of this figure includes colorized features and shading. A black and white copy of the figure should not be used because it may not accurately represent the information presented.

Legend

- Chatsworth Formation Monitoring Well
- Shallow Monitoring Well
- Property Boundary Line
- Streams
- TTF Interim Status Facility (Area addressed in the Interim Status Facility Closure)
- Area of Buried Debris (1981)
- Area of Sediment (1981)
- Excavation Perimeter (1982)
- Approximate Location where Anomalies Identified by ICF Kaiser (1993) were Exhumed
- Former Concrete Ponds/Pads
- Soil Sample Collected by Harding Lawson Associates (1981-1982)
- Soil Sample Collected by GWRC, 1993-1994
- Soil Sample Collected by Haley & Aldrich/DTSC (2005)
- Area I Burn Pit (SWMU 4.8) Boundary
- Earthen Pond

SL-32 — Soil ID
@ 0-0.5 bls — Depth in Feet bls = Below land surface
Copper 33 mg/kg — Analyte Concentration Units

TEQ = Total Equivalent

0 pg/g* — A TEQ value of zero is reported in validation data due to OCDD detection in both soil and blank samples.

Pre-I.M. Soil Sample Collected by Mongomery Watson-Harza (2006) These results are shown in blue boxes.

N W E S

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SCALE IN FEET

HALEY & ALDRICH

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VENTURA COUNTY, CALIFORNIA

HISTORICAL SOIL SAMPLES WITH ELEVATED CONCENTRATIONS OF ANALYTES - NORTHEAST AREA AREA I BURN PIT - SWMU 4.8

SCALE: AS SHOWN
JUNE 2006

FIGURE 5

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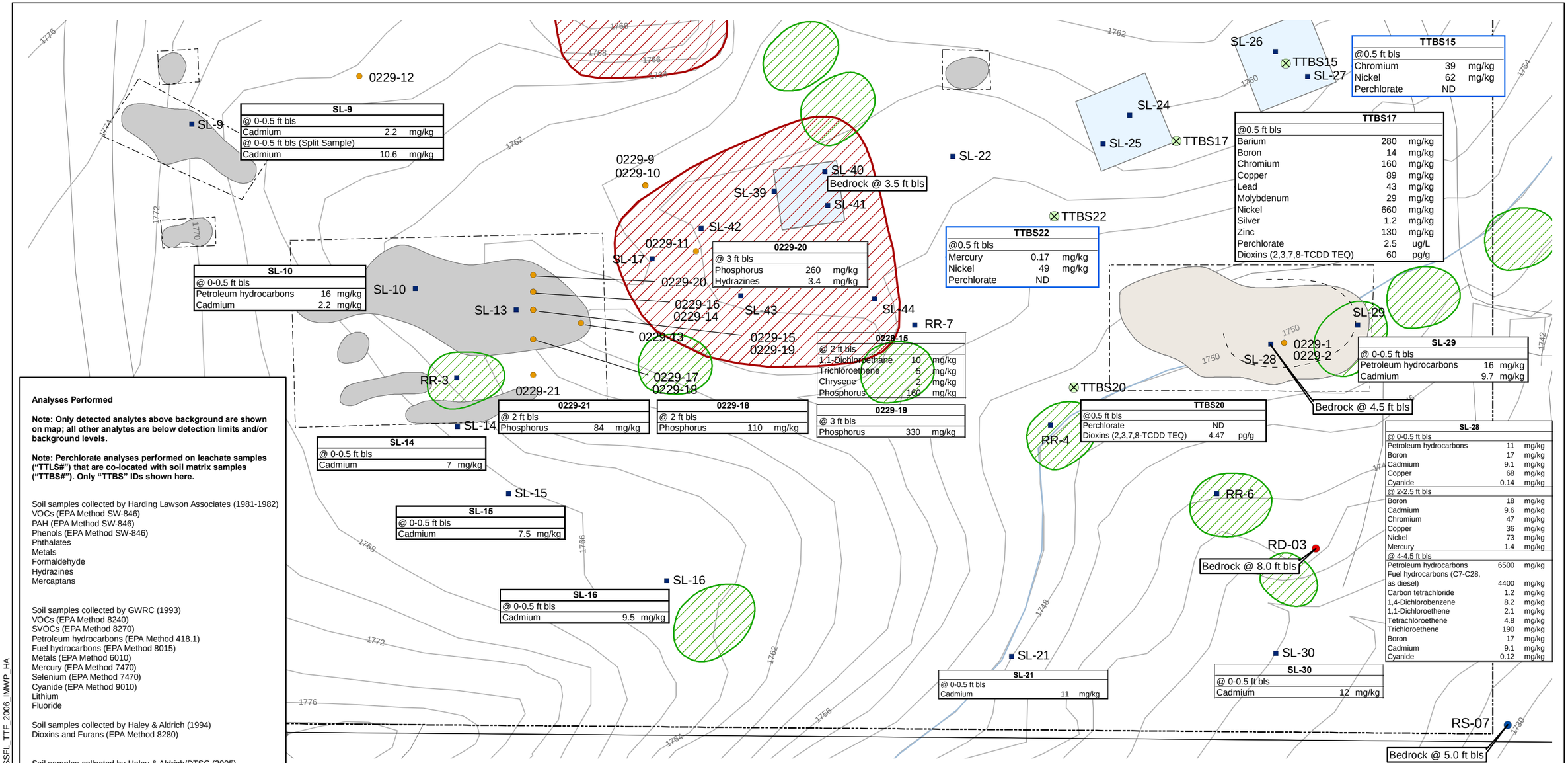

Analyses Performed

Note: Only detected analytes above background are shown on map; all other analytes are below detection limits and/or background levels.

Note: Perchlorate analyses performed on leachate samples ("TTLS#") that are co-located with soil matrix samples ("TTBS#"). Only "TTBS" IDs shown here.

Soil samples collected by Harding Lawson Associates (1981-1982)
VOCs (EPA Method SW-846)
PAH (EPA Method SW-846)
Phenols (EPA Method SW-846)
Phthalates
Metals
Formaldehyde
Hydrazines
Mercaptans

Soil samples collected by GWRC (1993)
VOCs (EPA Method 8240)
SVOCs (EPA Method 8270)
Petroleum hydrocarbons (EPA Method 418.1)
Fuel hydrocarbons (EPA Method 8015)
Metals (EPA Method 6010)
Mercury (EPA Method 7470)
Selenium (EPA Method 7470)
Cyanide (EPA Method 9010)
Lithium
Fluoride

Soil samples collected by Haley & Aldrich (1994)
Dioxins and Furans (EPA Method 8280)

Soil samples collected by Haley & Aldrich/DTSC (2005)
Dioxins and Furans (EPA Method 8290)

Please Note: The original version of this figure includes colorized features and shading. A black and white copy of the figure should not be used because it may not accurately represent the information presented.

Legend

- Chatsworth Formation Monitoring Well
- Shallow Monitoring Well
- Property Boundary Line
- Streams
- TTF Interim Status Facility (Area addressed in the Interim Status Facility Closure)
- Area of Buried Debris (1981)
- Area of Sediment (1981)
- Excavation Perimeter (1982)
- Approximate Location where Anomalies Identified by ICF Kaiser (1993) were Exhumed
- Former Concrete Ponds/Pads
- Soil Sample Collected by Harding Lawson Associates (1981-1982)
- Soil Sample Collected by GWRC, 1993-1994
- Soil Sample Collected by Haley & Aldrich/DTSC (2005)
- Area I Burn Pit (SWMU 4.8) Boundary
- Earthen Pond

SL-32 Soil ID
@ 0-0.5 bls Depth in Feet bls = Below land surface
Copper 33 mg/kg Analyte Concentration Units

TEQ = Total Equivalent

Pre-I.M. Soil Sample Collected by Mongomery Watson-Harza (2006)
These results are shown in blue boxes.

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SCALE IN FEET

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VENTURA COUNTY, CALIFORNIA

HISTORICAL SOIL SAMPLES WITH ELEVATED CONCENTRATIONS OF ANALYTES - SOUTHEAST AREA AREA I BURN PIT - SWMU 4.8

SCALE: AS SHOWN
JUNE 2006

FIGURE 6

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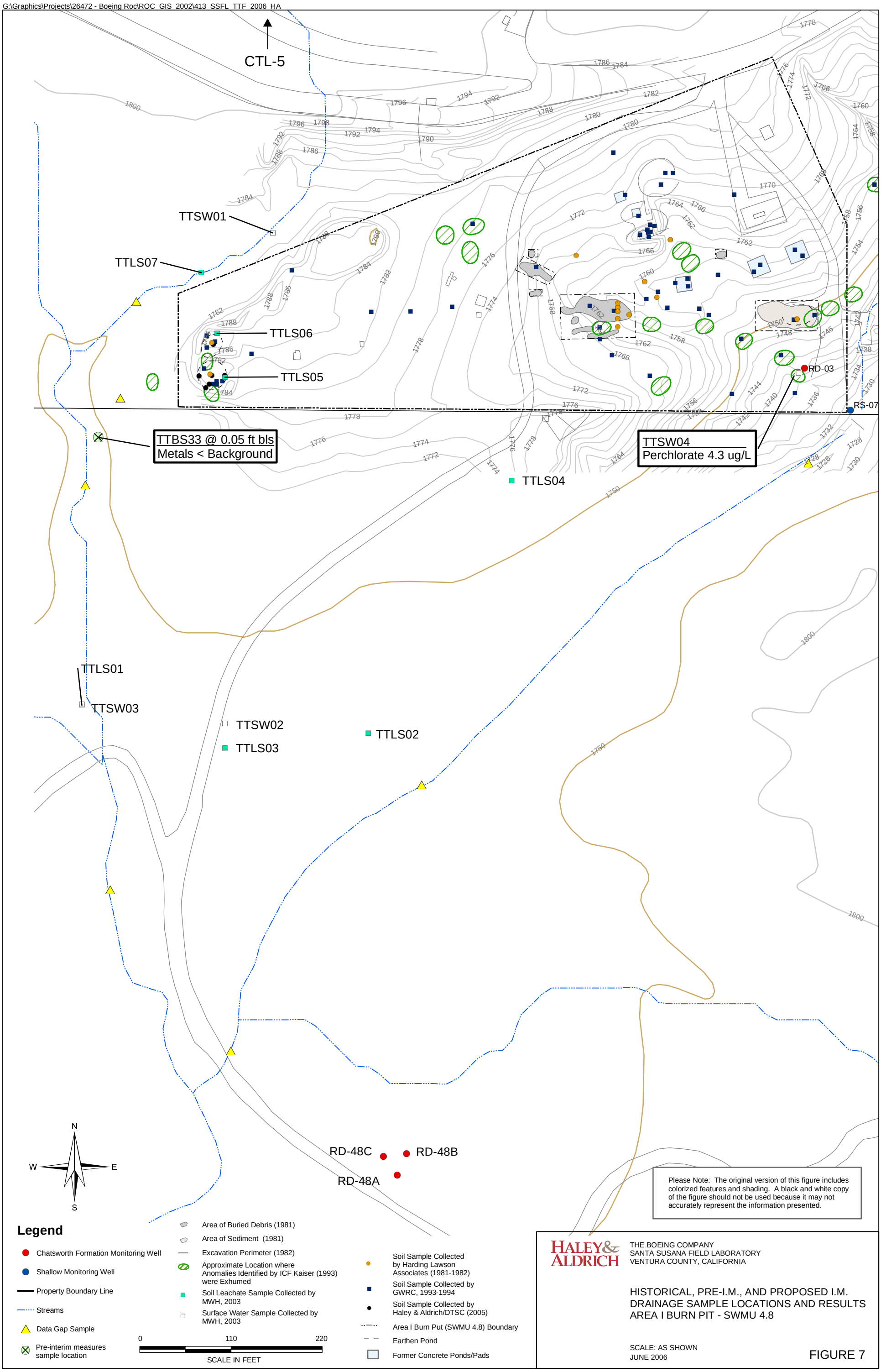

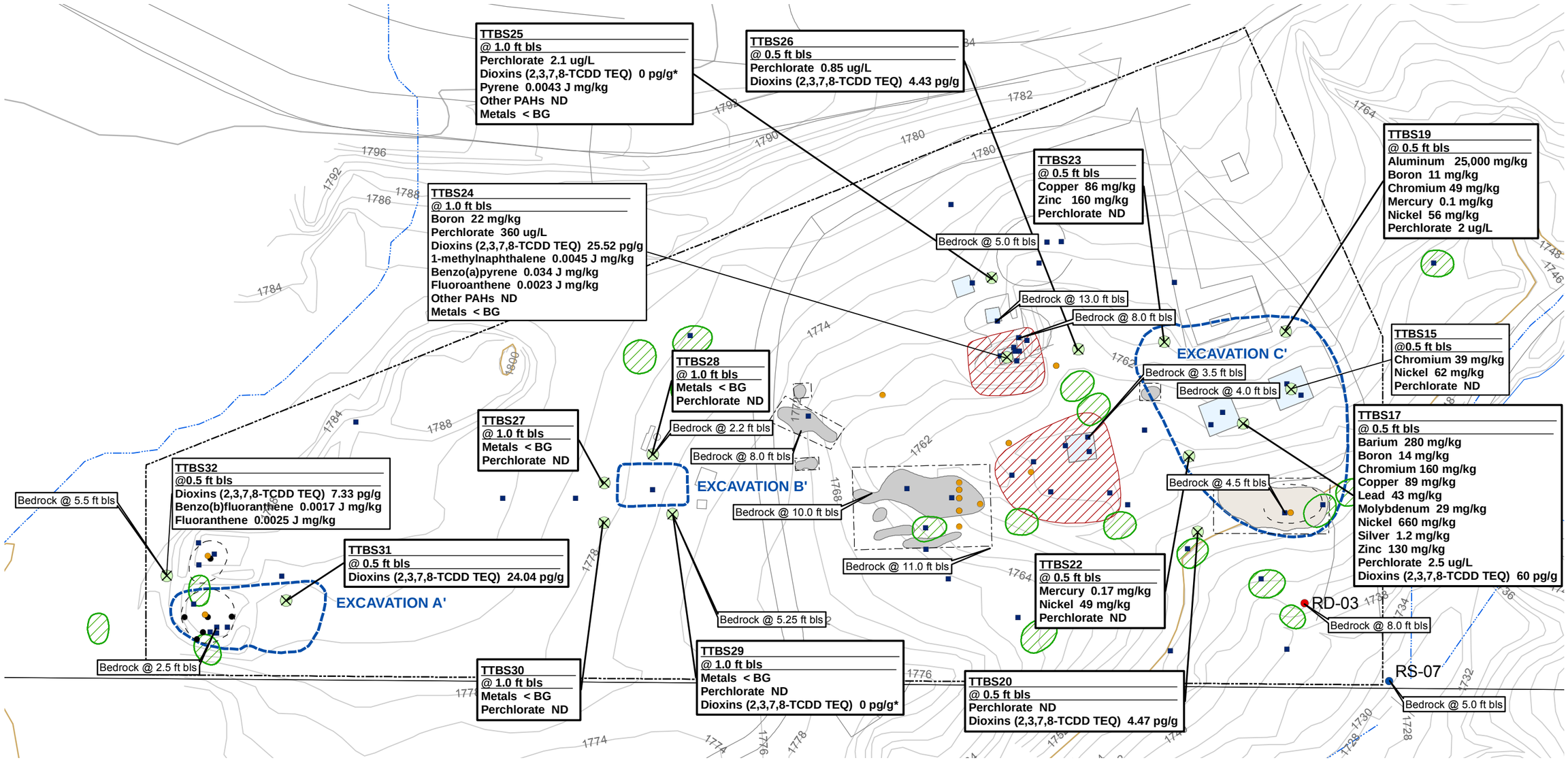

Legend

- Chatsworth Formation Monitoring Well
- Shallow Monitoring Well
- Property Boundary Line
- Streams
- Phase I Excavations
- TTF Interim Status Facility (Area addressed in the Interim Status Facility Closure)
- Area of Buried Debris (1981)
- Area of Sediment (1981)
- Excavation Perimeter (1982)
- Approximate Location where Anomalies Identified by ICF Kaiser (1993) were Exhumed

TEQ = Total Equivalent
BG = Background
ND = Not Detected
J = Estimated Value

- Soil Sample Collected by Harding Lawson Associates (1981-1982)
- Soil Sample Collected by GWRC, 1993-1994
- Soil Sample Collected by Haley & Aldrich/DTSC (2005)
- Area I Burn Pit (SWMU 4.8) Boundary
- Earthen Pond
- Former Concrete Ponds/Pads
- Pre-I.M. Soil Sample Collected by Mongomery Watson-Harza (2006)

0 pg/g* A TEQ value of zero is reported in validation data due to OCDD detection in both soil and blank samples.

Note: Perchlorate analyses performed on leachate samples ("TTLS#") that are co-located with soil matrix samples ("TTBS#"). Only "TTBS" IDs shown here.

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PRE-INTERIM MEASURES SOIL SAMPLING LOCATIONS AND RESULTS AND PROPOSED PHASE I EXCAVATIONS
AREA I BURN PIT - SWMU 4.8

SCALE: AS SHOWN
JUNE 2006

FIGURE 8

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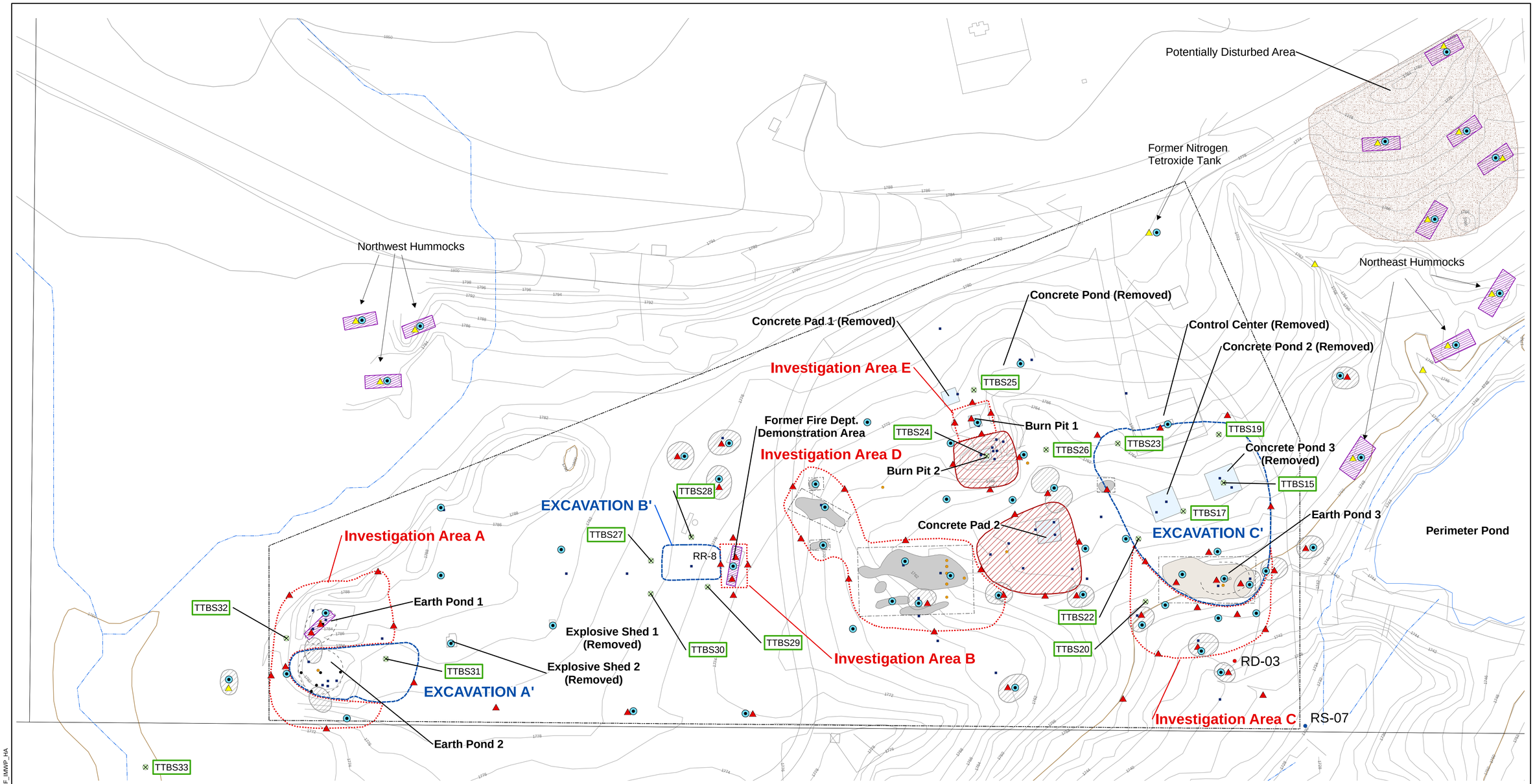

Please Note: The original version of this figure includes colorized features and shading. A black and white copy of the figure should not be used because it may not accurately represent the information presented.

Legend

- Chatsworth Formation Monitoring Well
- Shallow Monitoring Well
- Property Boundary Line
- Streams
- Potentially Disturbed Area
- Potential Exploratory Trench Location
- Pre-I.M. Soil Sample Collected by Montgomery Watson-Harza (2006)
- TTF Interim Status Facility (Area addressed in the Interim Status Facility Closure)
- Targeted Phase II Investigation Area
- Proposed I. M. Sampling Locations (Described in Table VIII)
- Focused Soil Sample
- Data Gap Sample
- Soil Vapor Screening Sample
- Area of Buried Debris (1981)
- Area of Sediment (1981)
- Excavation Perimeter (1982)
- Approximate Location where Geophysical Anomalies Identified by ICF Kaiser (1993) were Exhumed
- Soil Sample Collected by Harding Lawson Associates (1981-1982)
- Soil Sample Collected by GWRC, 1993-1994
- Soil Sample Collected by Haley & Aldrich/DTSC (2005)
- Area I Burn Pit (SWMU 4.8) Boundary
- Earthen Pond
- Former Concrete Ponds/Pads

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SCALE IN FEET

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VENTURA COUNTY, CALIFORNIA

SOIL SAMPLING LOCATIONS (I.M. PHASE II) AND TARGETED INVESTIGATION AREAS
AREA I BURN PIT - SWMU 4.8

SCALE: AS SHOWN
JUNE 2006

FIGURE 9

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Revised Interim Measures Work Plan for the
Area I Burn Pit – Solid Waste Management Unit (SWMU) 4,8
Santa Susana Field Laboratory
Ventura County, California
June 9, 2006

This revised interim measures work plan does not include all attachments from the original document due to the large file size and website posting requirements. If you need copies of a specific document, please contact the DTSC project manager listed on the document.