

Backhoe Trenching/Test Pits for Sample Collection

SSFL SOP 5
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1.0 Objective

The objective of this technical standard operating procedure (SOP) is to define the techniques and requirements for collecting soil samples and for characterizing the type of soil and debris from the unconsolidated subsurface zone using a backhoe at the Santa Susana Field Laboratory (SSFL) site. Two types of trenching activities will be conducted (1) trenching to observe debris and collect samples and (2) test pits to characterize subsurface soil, identify geophysical anomalies, and to determine if debris is present or not. In most cases, test pits are not expected to be sampled. General sampling techniques discussed in this SOP include use of sampling with a slide hammer and stainless steel sleeves from the side walls of the trench or from the backhoe bucket. Samples for will be contained in the EnCore® sampler or in the sleeves.

2.0 Background

2.1 Definitions

Backhoe - An excavator to which a shovel bucket is attached to a hinged boom and is drawn backward to excavate materials.

EnCore® Sampler- A single use plastic sampling device, typically with a capacity of 5 grams, used to obtain undisturbed, unconsolidated material samples (e.g., soil) for laboratory analyses. The sampler is inserted into a metal T-handle and open end of the sampler is pushed directly into the soil.

Grab Sample - A discrete portion or aliquot of material taken from a specific location at a given point in time.

Slide Hammer- A drive tool is used to drive and retract a 6-inch long thin-walled stainless steel sampler.

Subsurface Soil - The unconsolidated, or non-lithified, material that exists deeper than 6 inches below the ground surface (bgs).

Unconsolidated Zone - A layer of non-lithified earth material (soil) that has no mineral cement or matrix binding its grains.

2.2 Associated Procedures

- SSFL SOP 1, *Procedures for Locating and Clearing Phase 3 Samples*
- SSFL SOP 6, *Field Measurement of Total Organic Vapors*
- SSFL SOP 7, *Field Measurement of Residual Radiation*
- SSFL SOP 8, *Field Data Collection Documents, Content, and Control*
- SSFL SOP 9, *Lithologic Logging*
- SSFL SOP 10, *Sample Custody*
- SSFL SOP 11, *Packaging and Shipping Environmental Samples*
- SSFL SOP 12, *Field Equipment Decontamination*
- SSFL SOP 13, *Guide to Handling Investigation Derived Waste*
- SSFL SOP 14, *Geophysical Survey*
- SSFL SOP 15, *Photographic Documentation of Field Activities*
- SSFL SOP 16, *Control of Measurement and Test Equipment*

2.3 Discussion

Trenches and test pits will be excavated using a backhoe for visual observations of buried debris material (particularly that observed through geophysics) and to access the subsurface for soil sampling. A backhoe will also be used to provide

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access to subsurface materials, including building debris and rubble that a DPT rig cannot penetrate, or where test pits are required to observe geophysical anomalies. Soil samples will be collected from trenches (and possibly test pits) either at depths specified in Field Sampling Plan (FSP) Addendum or at locations with observed discoloration, staining, petroleum odors, or elevated photoionization detector (PID) readings.

3.0 General Responsibilities

Excavation Subcontractor – All backhoe trenching and test pits will be performed by a subcontractor.

Field Team Leader–The field team leader (FTL) is responsible for ensuring that field personnel collect trenching and test pit subsurface soil samples in accordance with this SOP and the FSP Addendum.

Site Geologist–The person responsible for overseeing sample collecting, recording sampling information and for logging the soil sample.

Site Health and Safety Technician–The person who will use field screening instruments to monitor all field activities for VOCs and radiological contaminants and pre-shipment sample coolers. This person is a trained radiological technician who works under the guidance of Science Application International Corporation’s (SAIC’s) Certified Health Physicist (CHP).

4.0 Required Equipment

4.1 General

- Site-specific plans (e.g., FSP Addendum, health and safety)
- Field logbook
- Indelible black ink pens and markers
- Clear, waterproof tape
- Appropriate sample containers
- Bags of ice
- Sample labels
- Chain of custody forms
- Insulated cooler(s)
- Global Positioning System (GPS) unit
- 2-way radios
- Trash Bags
- Monitoring/screening instruments as required by the health and safety plan
- Plastic zip-top bags
- Personal protective clothing
- Plastic sheeting
- Nitrile or appropriate gloves
- Slide hammer and stainless steel sleeves
- EnCore sampler and T-handle
- Decontamination supplies
- Kimwipes or paper towels
- Custody seals
- Teflon squares and sleeve end caps
- 300-ft tape measure
- Disposable plastic spoons and knives

4.2 Backhoe Sampling

- Backhoe with a sufficient length boom to extend to 10+ft bgs
- Samples collected to a depth of 5 feet (ft) will be collected from the side walls of the trench/test pit using a slide hammer and stainless steel sleeves, as long as the side wall can be safely accessed at that depth. In some instances, safely reaching the sidewall at 5 ft bgs may not be possible and the bucket of the backhoe will be used to access soil material.
- Samples collected deeper than 5 ft bgs will be collected directly from the backhoe bucket using a slide hammer and stainless steel sleeves of soil material contained in the bucket that is not in contact with the bucket walls.
- VOC samples will be subsampled from the stainless steel sleeve using an EnCore sampling device.

Note: Personnel will not enter an excavation of any depth.

5.0 Procedures

5.1 Preparation

1. Review site-specific health and safety plan and FSP Addendum before initiating sampling activity.

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2. Don the appropriate personal protective clothing as indicated in the site-specific health and safety plan.
3. Locate sampling point(s) in accordance with project documents (e.g., FSP Addendum) and document pertinent information in the appropriate field logbook (SSFL SOP 8). Confirm GPS coordinates of each location (SSFL SOP 1).
4. The depth of sampling will be verified with a tape measure.
5. Use clean (decontaminated) sampling tools to obtain sample material from each specified sample location.
6. The Site Health and Safety Technician will perform contaminant screening using hand-held instruments at each sample location before sampling and for each sample collected (SSFL SOPs 6 and 7). The most recent spoils materials will be segregated to minimize cross-contamination. The breathing zone and excavated materials will be monitored continuously. If levels are detected above health and safety plan action levels (HASP page 8), work will be temporarily discontinued. If radiation levels exceed two-times (2X) background levels (HASP page 8), the Department of Energy (DOE), The Boeing Company (Boeing), and the California Department of Toxic Substances Control (DTSC) will be contacted. Site work will not resume at that location until further guidance is provided by DOE or Boeing. Contact information is in the health and safety plan.

The following steps must be taken to prepare the slide hammer for sampling.

1. Obtain the slide hammer, sample tube with the shoe and stainless steel liners.
2. Remove the sample tube shoe and insert a clean liner. Screw the shoe back onto the sample tube.
3. Screw the assembled sample tube onto the slide hammer.
4. After sampling remove the sampling liner from the sample tube for sample collection.
5. Decontaminate the sample tube and shoe (SSFL SOP 12).

5.2 Sample Collection

The following general steps must be followed when collecting all subsurface soil samples. Refer to Section 5.3 of this SOP for additional guidance on field sampling and preservation methods.

1. Wear clean gloves during handling of all sample containers and sampling devices. Change out gloves at each sampling location, or each time a new sample is to be collected, to avoid cross-contamination.
2. VOC samples or samples that may be degraded by aeration shall be collected first and with the least disturbance possible and consequently minimize analyte loss.
3. Record all sampling information, including environmental and/or soil and debris characterization, and sample depth in the field logbook (SSFL SOP 8) and on lithologic log forms as specified in the FSP Addendum. Describe sample lithology according to SSFL SOP 9. Document with photographs, as appropriate, per SSFL SOP 15.
4. Record specific sampling devices identified in the FSP Addendum in the field logbook. Document any and all deviations from the SOPs and the sampling plan in the field logbook and include rationale for changes. See SSFL SOP 8 for guidance on entering information into field log books.
5. Care must be taken to prevent cross-contamination and misidentification of samples as described in subsequent subsections of this SOP.

5.2.1 Backhoe Sampling

Note: Steps 2, 7, and 8 describe activities to be performed by a licensed heavy equipment operator, not CDM Smith personnel.

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The following steps must be followed when collecting environmental samples using a backhoe:

1. Verify that the parts of the backhoe that will come in contact with the soil to be sampled have been decontaminated per SSFL SOP 12 before excavation begins.
2. Excavate to the depth specified in the FSP Addendum.
3. Visually inspect and log the soil profile in accordance with SSFL SOP 9, and record the types of debris (if present) within the trench. Screen for VOCs and radiation in accordance with SSFL SOPs 6 and 7.
4. If it can be performed safely, collect soil samples from the sidewalls of backhoe trench/test pit at the specified depth using a slide hammer sampler and stainless steel sleeves. If the sample will be deeper than 5 feet bgs, the sample will be collected from the backhoe bucket (from the middle of the bucket and untouched by the bucket) using a slide hammer and stainless steel sleeves. Personnel will not enter excavations under any circumstances.
5. Soil sample depths and sample volumes to address required analyses are presented in Table 1 of FSP Addendum.
6. When sample collection has been completed in the trench, backfill the trench with the excavated material. Compact the surface of the former excavation/test pit with backhoe bucket and/or tires. Spread any extra excavation spoils on the ground surface in the vicinity of the trench and test pit.
7. Once the trench has been backfilled, decontaminate backhoe in accordance to SSFL SOP 12.
8. Place sampling PPE in a plastic trash bag and transfer decontamination fluids to a storage container per SSFL SOP 13.
9. Complete the field logbook entries (SSFL SOP 8), being sure to record all relevant information before leaving the site.

5.2.2 Sampling With a Slide Hammer

Follow the steps below when collecting environmental soil samples using a slide hammer:

1. Obtain the sample by driving the slide hammer into side wall of test pit (depths above 5 ft bgs) or into sample material in backhoe bucket (depths below 5 ft). Retract hammer and remove the stainless steel liner from the tube. Collect and handle the sample in accordance with 5.2.3 and 5.2.4.
2. Proceed with additional sample collection as identified for the sampling location in Table 1 of FSP Addendum.
3. Decontaminate all equipment according to SSFL SOP 12 between each sample.
4. Complete the field logbook (SSFL SOP 8) entry and lithologic log form (SSFL SOP 9), being sure to record all relevant information before leaving the site.

5.2.3 Method for Collecting Soil Samples for Volatile Organic Compound Analysis

The following text contains the recommended SW-846 Test Methods 5035 procedure for sampling and field preservation of soil samples for volatile organic compound (VOC) analysis, which includes the EnCore® Sampler Method for low-level VOC analyses. Equipment requirements in addition to the equipment specified in Section 4.0 of this SOP for each method are indicated at the beginning of each subsection.

1. When collecting grab sampling for VOC analysis, it is necessary to minimize sample disturbance and consequently minimize analyte loss.
2. Wear new, clean gloves during handling of all sample containers and sampling devices. Change out gloves at each sampling location, or each time a new sample is to be collected, to avoid cross-contamination.
3. VOC samples shall be collected first as grab samples. After clearing sample site, use a clean slide hammer and decontaminated stainless steel sleeves to drive and retract the sample sleeve into and from the trench wall. EnCore samplers will be used to collect subsamples for the required analytical protocol (e.g., VOCs, 1,4-dioxane, and total

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petroleum hydrocarbons-gasoline range organics [TPH-GRO]) . The VOC sample will be collected from the bottom 6-inch interval of the stainless steel sleeve. Collection of VOC sample may require several slide hammer samples (stainless steel liners) to obtain the required sample volume.)

4. Once the sleeve is retrieved, quickly screen the open end of the sleeve and the sample borehole for VOCs and radioactivity (SSFL SOPs 6 and 7).
5. Remove EnCore sampler and cap from package and attach T-handle to sampler body. Ensure that the sampler is locked into the T-handle before sampling.
6. Push the sampler into the freshly-exposed sampling from the bottom of the sampler sleeve until the O-ring is visible within the hole on the side of the T-handle. If the O-ring is not visible within this window, then the sampler is not full.
7. Extract the sampler and wipe the sampler sides with a clean paper towel or Kimwipe so that the sampler cap can be tightly attached.
8. While still locked into the T-handle, push the sampler cap on the head of the sampler with a twisting motion to secure it to the sampler body.
9. Remove the sampler from the T-handle and rotate the sampler stem counterclockwise until the stem locks in place to retain the sample within the sampler body.
10. Repeat procedure for each of the remaining samplers.
11. When collecting soil samples using the EnCore Sampler Method, collection of soil for moisture content analysis is required. Results of the moisture analysis are used to adjust "wet" concentration results to "dry" concentrations to meet analytical method requirements. The moisture sample will be collected in a separate 4 ounce (oz.) glass jar. After collecting the required number of EnCore samples (typically five), fill one 4 oz. jar with soil from bottom of stainless steel sleeve for moisture analysis using a disposable plastic spoon or knife.
12. After VOC and moisture sampling, discard the remaining soil within the stainless steel sleeves to the plastic sheets or back to the borehole, if completed.
13. Complete the sample labels by filling in the appropriate information (e.g., sample identification, date and time of sample collection, and requested analyses [per Table 1 of FSP Addendum]) and securing the label to the container.
14. Store samples at 4°C ($\pm 2^\circ\text{C}$) until samples are delivered to the designated analytical laboratory. Determine sample holding times with the appropriate analytical laboratory. Samples must be shipped and delivered to the analytical laboratory for extraction within 48 hours.
15. Pack all samples per SSFL SOP 11 and/or laboratory requirements. Include properly completed documentation and affix signed and dated custody seals to the cooler lid. See SSFL SOP 10 for guidance on sample custody procedures.
16. Decontaminate all non-disposable sampling equipment in accordance with SSFL SOP 12.

Note: A water trip blank will be included with sample coolers containing VOC samples.

5.2.3 Method for Collecting Samples for Nonvolatile Organic or Inorganic Compound Analyses

The requirements for collecting samples of subsurface soil for nonvolatile organic or inorganic analyses are as follows:

1. Use a clean slide hammer and decontaminated stainless steel sleeves to drive the sampler into the trench wall (above 5 ft. bgs) or soil in the backhoe bucket (depths below 5 ft bgs). Several sleeves may be required from this interval to collect the necessary amount of subsurface soil to satisfy the analytical protocol (refer to sampling rationale table in Table 1 of FSP Addendum). Quickly screen the open end of the sleeve and the sample borehole for VOCs and radioactivity (SSFL

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- SOPs 6 and 7).
2. Collect sub samples for chromium (Cr^{3+}) and/or hexavalent chrome (Cr^{6+}) and/or pH from the center of the stainless steel sleeve into a glass jar using a disposable plastic spoon or knife. Ensure that the soil that was in contact with the sleeve is not collected in the jar.
 3. Prior to capping the sleeve for the remaining non-volatile parameters, place a Teflon® cover sheets over each end of the sample. Secure the respective cap on each sample container immediately after collection.
 4. Label the sample sleeve with "top" and "bottom" designations.
 5. Wipe the sample containers with a clean paper towel or Kimwipe to remove any residual soil from the sample container surface.
 6. Fill out the sample label with the appropriate sample information (e.g., sample identification, date/time of sample collection, requested analyses per FSP Addendum Table 1) and attach to sample sleeve.
 7. Place sample containers in individual zip-top plastic bags and seal the bags. Place baggies onto ice in an insulated cooler to maintain at 4°C ($\pm 2^{\circ}\text{C}$).
 8. Decontaminate all non-disposable sampling equipment in accordance with SSFL SOP 12.

5.3 Sample Packing and Shipment

1. Store samples at 4°C ($\pm 2^{\circ}\text{C}$) until samples are delivered to the designated analytical laboratory.
2. Pack all samples per SSFL SOP 11 and/or laboratory requirements. Include properly completed documentation and affix signed and dated custody seals to the cooler lid. See SSFL SOP 10 for guidance on sample custody procedures.

6.0 Restrictions/Limitations

Extreme care must be taken when working around open excavations. Maintain safe distances from trench sidewalls to avoid injury should a sidewall of the trench sloughing back into the excavation. Personnel will not enter any trenches/test pits at any time.

Also, when grab sampling for VOC analysis or for analysis of any other compound(s) that may be degraded by aeration, it is necessary to minimize sample disturbance and consequently minimize analyte loss. The representativeness of a VOC grab sample is difficult to determine because the collected sample represents a single point, is not homogenized, and has been disturbed.

7.0 References

American Society for Testing and Materials (ASTM).2000. *Standard Test Method for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes*. Standard Method D1587-00.

U. S. Department of Energy.1996. Hazardous Waste Remedial Actions Program. *Quality Control Requirements for Field Methods*, DOE/HWP-69/R2. September.

_____ . Hazardous Waste Remedial Actions Program. *Standard Operating Procedures for Site Characterizations*, DOE/HWP-100/R1. September 1996 or current revision.

U.S. Environmental Protection Agency. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846)*, Third Edition, November 1986, (as amended by Updates I, II, IIA, IIB, III, and IIIA, June 1997). Method 5035 (**Note:** § 6.2.1.8 of this method says samples stored in EnCore™ samplers shall be analyzed within 48 hours or transferred to soil sample vials in the laboratory within 48 hours): December 1996, Revision O, Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples.