

Subsurface Soil Sampling With Hand Auger

SSFL SOP 3
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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 shallow subsurface soil samples for environmental characterization purposes from the unconsolidated subsurface. The sampling techniques discussed in this SOP involve use of hand augers at the Santa Susana Field Laboratory (SSFL) site.

2.0 Background

2.1 Definitions

Slide Hammer- A drive tool is used to drive and retract a 6-inch long and approximately 2-inches in diameter, thin-walled stainless steel sleeve.

Hand Auger - A stainless steel cylinder (bucket) approximately 3 to 4 inches (in) in diameter and 1 foot (ft) in length, open at both ends with the bottom edge designed to advance perpendicular to the ground surface with a twisting motion into unconsolidated subsurface material to obtain a soil sample. The auger has a T-shaped handle (fixed or ratchet used for manual operation) attached to the top of the bucket by extendable stainless steel rods.

EnCore® Sampler- A disposable 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 the open end of the sampler pushed directly into the soil.

Subsurface Soil - The unconsolidated, or non-lithified, material that exists deeper than approximately 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 15, *Photographic Documentation of Field Activities*
- SSFL SOP 16, *Control of Measurement and Test Equipment*

2.3 Discussion

Subsurface soil samples, or those taken from depths below 6 inches, are collected using a hand auger to depths up to 10 ft bgs or bedrock refusal. Subsurface samples in locations inaccessible to a DPT rig will be collected by drilling using hand augers to the sample depth, and then sample collection from the auger hole using a slide hammer and stainless steel sleeves. The maximum depth of hand auger samples is typically 10 feet bgs. All sample locations and sample materials will be screened by the Site Health and Safety Technician using hand-help instruments. In addition, all SOPs will be on hand

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with the field sampling team.

3.0 General Responsibilities

Field Team Leader - The field team leader is responsible for ensuring that field personnel collect subsurface soil samples in accordance with the Field Sampling Plan (FSP) Addendum and this SOP.

Site Geologist – The person responsible for collecting and 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 at the Sampling Location

4.1 General

- Site-specific plans (e.g., FSP Addendum, health and safety) including all SOPs
- Field logbook
- Appropriate sample containers
- EnCore samplers and T-handle
- Insulated cooler(s)
- Bags of ice
- Nitrile or appropriate gloves
- 2-way radios
- Indelible black ink pens and markers
- Slide hammer with stainless steel sleeves
- Global Positioning System (GPS) unit
- Monitoring/screening equipment per health and safety plan
- Personal protective clothing and equipment
- Plastic sheeting
- Plastic zip-top bags
- Trash bags
- Disposable plastic spoons or knives
- Sample labels
- Decontamination supplies
- Kimwipes or paper towels
- Teflon squares and sleeve end caps

4.2 Manual (Hand) Auger Sampling

- T-handle
- Hand auger: extensions, bucket-, or tube-type auger as required by the site-specific plans
- Extension rods
- Wrench(es), pliers

5.0 Procedures

5.1 Preparation

1. Review site-specific health and safety plan and FSP Addendum before initiating sampling activity.
2. Don the appropriate personal protective clothing as indicated in the site-specific health and safety plan.
3. Locate sampling location(s) in accordance with FSP Addendum and document pertinent information in the appropriate field logbook (SSFL SOP 8). Confirm GPS coordinates of each location (SSFL SOP 1).
4. Use clean, (decontaminated) sampling tools per SSFL SOP 12 used to obtain sample material from each specified sample location.
5. Carefully remove stones, vegetation, debris, etc. from the ground surface in the sampling location area. Clear the sample location using a new and/or appropriately decontaminated tool as described to expose a fresh sampling surface.
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

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(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.

5.2 Sample Collection

The following general steps must be followed when collecting all subsurface soil samples. Soil samples will be preserved by placing the samples on ice.

1. Wear clean gloves during handling of 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 will be collected first and with the least disturbance possible to minimize sample disturbance and consequently minimize analyte loss.
3. While advancing the hand auger, the subsurface lithology shall be described according to SSFL SOP 9.
4. Specific sampling devices are identified in the FSP Addendum and will be recorded 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 Manual (Hand) Auger Sampling Using a Slide Hammer

The following steps must be followed when collecting environmental soil samples using a hand-auger and slide hammer:

1. Auger to the depth required for sampling, per the FSP Addendum. Place cuttings on plastic sheeting. If possible, lay out the cuttings in stratigraphic order.
2. During auger advancement and sample collection, record observations made of the geologic features of the soil or sediments per SSFL SOP 9.
3. Stop advancing the auger when the top of the specified sampling depth has been reached. Remove the auger from the hole and set aside for future decontamination (see line item 11 below).
4. Obtain the subsurface soil sample by driving the sample sleeve through the specified sample interval with the slide hammer. Remove the stainless steel liner from the slide hammer and quickly screen the sleeve for VOCs and radiation (SSFL SOPs 6 and 7).
5. Immediately subsample for VOCs (if required) by FSP Addendum Table 1, observe stained soil, petroleum odor, or elevated PID reading) by pushing the EnCore sampler into the soil in the bottom end of the sampling sleeve. See

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Section 5.2.2.

6. Decontaminate the auger bucket, sample tube and shoe, and repeat the preceding steps for sample collection from deeper depths as required by the FSP Addendum.
7. When sampling is complete, place cuttings back into the borehole, and top off with bentonite pellets, and hydrate as necessary to bring former borehole to ground surface. Place plastic sheeting and gloves in garbage bag and transfer decontamination water to storage container as specified SSFL SOP 13.
8. Decontaminate all equipment between each sample according to SSFL SOP 12.
9. Complete the field logbook entry and other forms, being sure to record all relevant information before leaving the sample location.

5.2.2 Method for Collecting Soil Samples for Volatile Organic Compound Analysis

The following text contains the recommended SW-846 Test Method 5035 procedure for sampling and field preservation of soil samples for volatile organic compound (VOC) analyses, which includes the EnCore® Sampler Method for low-level VOC analyses.

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 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. EnCore samplers will be used to collect subsamples for the required analytical protocol (e.g., VOCs, 1,4-dioxane and total petroleum hydrocarbon-gasoline range organics [TPH-GRO]) from sample sleeves collected at depth. The VOC samples will be collected from the bottom of the 6-inch stainless steel sleeve. Several slide hammer samples (stainless steel liners) may be required to obtain the required sample volume for all VOC analyses.
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 soil in 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 procedures for each of the remaining Encore 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

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method requirements. The moisture sample will be collected in a separate 4 oz. glass jar. If only VOCs/1,4-dioxane are to be sampled at a location, after collecting the required number of EnCore samples, fill one 4 oz. jar with soil from bottom of stainless steel sleeve for moisture analysis using a disposable plastic spoon or knife.

12. Remaining material in the sleeve may be used for any required non-volatile analyses (Section 5.2.3)
13. Complete the sample labels by filling in the appropriate information (i.e., sample identification, date and time of sample collection, and requested analyses per FSP Addendum Table 1 and securing the label to the container.
14. Store samples at 4°C ($\pm 2^\circ\text{C}$) until samples are delivered to the FTL or sample coordinator (per SOP 10) for sample packing and shipment (per SOP 11) to the designated analytical laboratory. EnCore samplers must be shipped and delivered to the analytical laboratory for extraction within 48 hours.
15. 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 a sample through a 6-inch interval at the prescribed depth. 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 1 in the FSP Addendum). Quickly screen the open end of the sleeve and the sample borehole for VOCs and radioactivity (SSFL SOPs 6 and 7).
2. Collect sub samples for 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 sheet over each end of the sample. Secure the respective cap on each sample container immediately after collection.
- 4.
5. Label the sample sleeve with "top" and "bottom" designations.
6. Wipe the sample containers with a clean paper towel or Kimwipe to remove any residual soil from the sample container surface.
7. 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.
8. 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 ($\pm 2^\circ\text{C}$) until samples are delivered to the FTL or sample coordinator (per SOP 10) for sample packing and shipment (per SOP 11) to the designated analytical laboratory.
9. Decontaminate all non-disposable sampling equipment in accordance with SSFL SOP 12.

6.0 Restrictions/Limitations

Before conducting the soil sampling at each location, underground utilities and structures must be demarcated on the ground surface. In addition, archeological and cultural resources as well as Native American cultural concerns must be cleared. A subcontractor will be used to locate and mark the utility lines. The selected sampling location shall be a safe distance from the demarcated utility. In some cases, records regarding utility locations may not exist.

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 analyte loss. The representativeness of a VOC grab sample is difficult to

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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. 1999. *Standard Test Method for Penetration Test and Split Barrel Sampling of Soils*. Standard Method D1586-99.

_____.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.