

LOS ALAMOS NATIONAL LABORATORY
ENVIRONMENTAL RESTORATION
Records Processing Facility
ER Records Index Form

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Core Barrel Sampling for Subsurface Earth Materials

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Core Barrel Sampling for Subsurface Earth Materials

1.0 PURPOSE

The following procedure outlines the steps to be followed when extracting subsurface earth material samples using the method of core barrel sampling.

Decontamination of the core barrel parts and associated apparatus is not included as part of this standard operating procedure (SOP).

2.0 SCOPE

2.1 Applicability

This procedure should be followed by all personnel responsible for obtaining subsurface solid samples by using a drill rig and core barrels. Refer to LANL-ER-SOP-04.01, Drilling Methods and Drill Site Management, for further information on drilling at environmental restoration (ER) sites.

2.2 Training

The field team leader and field team members shall be familiar with the objectives of sampling with a core barrel and must document that they have read and do understand this procedure.

3.0 DEFINITIONS

Not applicable

4.0 BACKGROUND AND/OR CAUTIONS

When sampling soil or underlying sediments or other solid material, it is important to collect the required solid sample in a manner that least disturbs the material one is trying to extract. That is, one attempts to bring the subsurface sample to the surface in a way that the physical and chemical integrity of the sample is not compromised. In this manner, the sampler can determine, for instance, the relative density of the material, observe whether there is an obvious interface between horizons, or ascertain the actual color and other physical characteristics of the subsurface solids after they have been brought to the surface.

This SOP is not meant to be all encompassing in terms of including all the details of sampling with a core barrel for every type of constituent. Specialized sampling may require modifying these procedures and these modifications are outside of the purview of this operating procedure. This procedure will cover sampling of subsurface sediments for radionuclides (including tritium), metals, polychlorinated biphenyls, total petroleum hydrocarbons, and volatile and semivolatile organic compounds. Sampling

for other constituents may be included under this SOP (or modifications thereof) at the discretion of the field team leader and operable unit project leader (OUPL).

5.0 EQUIPMENT

Core barrels are generally 5 feet in length and made of mild alloy steel. They consist of a machined heavy-duty hollow steel tube split vertically into two equal sections. The ends of the two sections are threaded in a way that they are held together by screw fittings attached at each end. The core barrel is locked into place with the lead cutting auger by attachment to the drill rod or alternately through a wireline latch system. In the drill rod method one end of the core barrel is connected to the drill rig's drive mechanism through a hexagonal slide couple while the other end is fitted with a beveled hollow cutting edge that is screwed onto the core barrel. The inside diameter of the core barrel is typically 2.5 inches. Core barrels are machined to fit inside hollow stem augers and advance at the same rate as the auger flights. As the drill bit is advanced, the shoe of the core barrel (a piece of beveled steel) slightly precedes the advancing drill bit. A bearing in the drive head prevents the core barrel assembly from rotating with the outer hollow stem auger. In this fashion, undisturbed subsurface sediments are pushed up into the hollow core barrel and are not pulverized by the drill bit. Modifications of a core barrel include addition of stainless steel, brass or Teflon sleeves or plastic inserts that facilitate segregation of the solid material brought up from the bore hole according to depth and minimize loss of constituents such as volatile organic compounds.

Drilling with core barrel samplers may be restricted by the material to be drilled through. Since the cutting part of the core barrel precedes the drill bit, and has a less rugged construction than the drill bit, it may be impossible to use the core barrel method of sampling when drilling into harder rock material, cobbles or the like.

6.0 PROCEDURE

Before going in the field, the core barrels are disassembled and decontaminated. A standard decontamination procedure would be to scrub the core barrel with liquinox (liquid soap) solution followed by rinsing with distilled water. Steam cleaning can also be utilized in decontaminating core barrels. This latter service is provided by EM-7 at TA-50.

Care should be taken to prevent contamination of the core barrels during storage or transportation. After decontamination, the core barrels are enclosed in disposable polyethylene bags.

When ready to use, the two pieces of the core barrel are forced together by screwing on the two fittings at the top and the bottom of the core barrel.

The core barrel is attached to either a drill rod or wireline system and lowered through the hollow stem to the bottom of the hole. When finally deployed, the beveled or cutting edge of the core barrel protrudes just past the drill bit.

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The auger is connected to the drill drive head, and drilling commences over the length of the auger flight.

Groups HS-1 and HS-5 support personnel use portable field instruments to monitor the cuttings around the drill stem for radioactivity and volatile organic compounds. They will signal whether it is safe to remove the core barrel from the drill rig.

The core barrel is subsequently pulled out of the auger and out of the hole.

The core barrel is carried to the sample preparation area. By using clamps mounted on a table or other acceptable mechanism, the screw fittings at the ends of the core barrel are taken off and the core barrel split open.

Groups HS-1 and HS-5 personnel will take readings at each end of the core barrel to ascertain the safety of removing the material contained in the core barrel.

The core extracted from the borehole is then revealed.

The sections of core can be handled in a variety of ways, depending on the specific application or analysis to be performed with the solid sediments. One format is to segregate the five foot core length into 10 individual 6 inch sections.

Ordinarily, the segment to be submitted for analysis (or several segments, if a composite sample is to be analyzed) is placed in a stainless steel bowl and homogenized.

Aliquots of the homogenized sample are then placed in the relevant sample container.

A modification of the above procedure occurs when stainless steel, brass, Teflon or lexan sleeves are inserted into the core barrel. The sleeves can be cut to length and typically have an outside diameter of 2.5 inches. The decontaminated and labeled sleeves are loaded into the core barrel prior to the core barrel being connected to the rig and the auger flight. Polyethylene gloves will be worn by all personnel handling sleeves.

Instead of the core barrel itself being filled with earth materials, the sleeve inserts are filled.

When the core barrels are opened after an auger flight advancement of 5 feet, the sleeves are revealed.

The sleeves (if solid sleeves are used) are removed from the core barrel and fitted at each end with a plastic cap. If volatile organic compounds are an analyte of interest, a Teflon disc followed by a sheet of Teflon tape is placed over the end of the sleeve before the cap is attached.

Sleeves for volatile organic compounds are placed in a 12- x 12-inch zip lock bag and immediately cooled over ice.

If the soil sample is to be used for the analysis of semivolatile organic compounds, it would also be stored in an ice chest.

7.0 REFERENCES

Procedures directly associated with this procedure that should be included prior to drilling are the following:

LANL-ER-SOP-01.01, General Instructions for Field Personnel
LANL-ER-SOP-01.02, Sample Containers and Preservation
LANL-ER-SOP-01.04, Sample Control and Field Documentation
LANL-ER-SOP-01.05, Field Quality Control Samples
LANL-ER-SOP-04.01, Drilling Methods and Drill Site Management

EPA-600/4-83-020. Preparation of Soil Sampling Protocol: Techniques and Strategies

LANL-ER-AP-02.1, Procedure for LANL ER Records Management

Environmental Protection Group, EM-8: Standard Operation Procedure-Operation of Drill Unit Models CME 45 and 55 (if these drill rigs are being used)

8.0 RECORDS

Records are generated indirectly as a result of implementation of SOPs directly associated with this Procedure. These SOPs are listed in the references section.

These records will be transferred to the ER Records Processing Facility in accordance with the Procedure for LANL ER Records Management (LANL-ER-AP-02.1).

9.0 ATTACHMENTS

None

NON-PROCESSED INFORMATION