
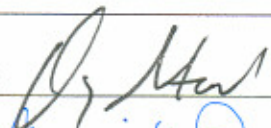



Identifier: SOP-06.26	Revision: 2	 <p>Los Alamos NATIONAL LABORATORY Los Alamos NM 87545</p>
Effective Date: 01/14/04		
Document Catalog Number: ER2003-0522		
Author: Mark Thacker		
<p>Risk Reduction and Environmental Stewardship— Remediation Services Project</p> <p>Standard Operating Procedure</p> <p>for Core-Barrel Sampling for Subsurface Earth Materials</p>		
<input checked="" type="checkbox"/> NES Approved		
Responsible Division Leader:	Signature & Date	
Doug Stavert	 12/14/05	
Responsible Line Manager:	Signature & Date	
Alison Dorries	 12/14/05	
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Revision Log

Revision No.	Effective Date	Prepared By	Description of Changes	Affected Pages
0	4/28/93	Robert Conrad	First edition of SOP	All
1	4/27/01	Rick Lawrence	Technical changes; update with new ER format	All
2	01/14/04	Mark Thacker	"Minor" changes: alignment with new format and RRES-RS Project organizational changes; no peer review required (QP-4.2).	All

Core-Barrel Sampling for Subsurface Earth Materials

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List of Acronyms and Abbreviations

FTL	Field Team Leader
LANL	Los Alamos National Laboratory
PPE	personal protective equipment
PTL	Project Team Leader
QP	quality procedure
QPPL	Quality Program Project Leader
RRES-RS	risk reduction and environmental stewardship—remediation services project
SOP	standard operating procedure
SSHASP	site-specific health and safety plan
VOC	volital organic compound

Core-Barrel Sampling for Subsurface Earth Materials

1.0 PURPOSE

This standard operating procedure (SOP) states the responsibilities and describes the process for collecting core-barrel samples of subsurface earth materials for the Los Alamos National Laboratory (LANL), Risk Reduction and Environmental Stewardship, Remediation Services (RRES-RS) Project.

2.0 SCOPE

- 2.1 All **RRES-RS Project participants** shall implement this mandatory SOP.
- 2.2 **Subcontractors** performing work under the RRES-RS Project's quality program shall follow this SOP.

OR

- 2.3 **Subcontractors** may use the subcontractor's procedure as long as the substitute meets the requirements prescribed by the RRES-RS Project Quality Management Plan, and the RRES-RS Project Quality Program Project Leader (QPPL) and a RRES-RS Project technical staff person approve the procedure before the subcontractor begins the designated activity.

3.0 TRAINING

- 3.1 **RRES-RS Project participants** shall train to and use the current version of this SOP; contact the author if the SOP text is unclear.
- 3.2 **RRES-RS Project participants** using this SOP shall document training in accordance with QP-2.2.
- 3.3 The responsible **Project Team Leader (PTL)** shall monitor the proper implementation of this procedure and ensure that the appropriate personnel complete all applicable training assignments.

4.0 DEFINITIONS

- 4.1 *Aliquot*—An evenly-divided portion of a whole. For example, a soil sample taken as a split of the entire amount collected.
- 4.2 *Core*—A cylindrical section of rock, sediments, or other earth materials that is collected as a sample of the interval penetrated by a drill bit and is brought to the surface for examination and/or analysis.
- 4.3 *Core-barrel sampler*—A stainless steel tube, the leading edge of which is mounted slightly ahead of the augers to capture and retain undisturbed

samples of soil, sediments, or other earth materials penetrated by the drill bit.

- 4.4 *Site-specific health and safety plan (SSHASP)*—Health and safety plan that is specific to a site or RRES-RS-related field activity that has been approved by an RRES-RS Project health and safety representative. This document contains information specific to the project including scope of work, relevant history, descriptions of hazards by activity associated with the project site(s), and techniques for exposure mitigation (e.g., personal protective equipment [PPE]) and hazard mitigation.
- 4.5 *Volatile organic compounds (VOCs)*—A class of chemical compounds, predominantly hydrocarbons and halogenated hydrocarbons, with low molecular weights and low boiling points that are insoluble or slightly soluble in water.

5.0 RESPONSIBLE PERSONNEL

The following personnel are responsible for activities identified in this procedure:

- Field Team Member
- Health and Safety Personnel
- Project Team Leader
- Quality Program Project Leader
- RRES-RS Project Participants
- Supervisor
- User

6.0 BACKGROUND AND PRECAUTIONS

- 6.1 **RRES-RS Project participants** shall use this SOP in conjunction with an approved SSHASP.
- 6.2 This SOP does not include all details of core-barrel sampling for every type of constituent. Specialized sampling may require a modification of these procedures beyond the scope of this SOP. This procedure is limited to sampling of subsurface sediments for radionuclides (including tritium), metals, polychlorinated biphenyls, total petroleum hydrocarbons, and volatile and semivolatile organic compounds. The field team may sample for other constituents under this SOP (or modifications thereof) at the discretion of the field team leader and project leader.
- 6.3 When sampling soil, underlying sediments or other earth materials it is important to collect the core sample in a manner that least alters the physical and chemical integrity. Examination of an undisturbed sample

allows the sampler to 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 in situ subsurface solids.

- 6.4 Handle all waste generated from core-barrel sampling operations in accordance with SOP-01.06.

7.0 EQUIPMENT

Listed below are the descriptions of commonly used equipment items, their capabilities, and limitations.

- 7.1 *Core-barrel samplers*—Generally five to 20 feet in length and made of stainless steel, core-barrel samplers consist of a machined heavy-duty hollow steel tube split vertically into two equal sections. Couplings hold the ends of the two threaded sections. Core barrels are designed for use in conjunction with hollow-stem, auger-type drilling systems. They are machined to fit inside and advance with the augers as they advance through the subsurface. The core barrel is locked into place with the lead cutting auger by attachment to the drill rod or alternatively through a wireline latch system. In the drill rod method, the upper end of the core barrel is connected to the drill rig's drive mechanism through a hexagonal slide coupling, and the lower end is fitted with a beveled hollow cutting edge, or shoe. As the drill bit is advanced, the core-barrel shoe 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.
- 7.2 *Core-barrel sleeves*—Hollow cylinders, or sleeves, made of stainless steel, brass, plastic, Teflon, or Lexan that are loaded into the core barrel to receive the core sample. The sleeves facilitate segregation of the core and minimize the loss of constituents such as volatile organic compounds (VOCs).
- 7.3 *Core-barrel sampling limitations*— The hardness of the material drilled through may restrict the drilling with core barrel samplers. Since the cutting part of the core barrel precedes the drill bit and has a less rugged construction than the drill bit, it may prove impossible to perform core-barrel sampling when drilling through hard rock material, cobbles, or other resistant strata.

8.0 PROCEDURE

Make any deviations from this SOP in accordance with QP-5.7 and/or SOP-01.01.

- 8.1 Perform Pre-Operation Activities
 - 8.1.1 Before going to the field, **field team members** shall disassemble and decontaminate the core barrels (i.e., a standard decontamination procedure is scrubbing the core barrel with liquinox (i.e., liquid soap) solution, followed by a rinse with distilled water; steam cleaning is also allowed).
 - 8.1.2 After decontamination, **field team members** shall store the core barrels in disposable polyethylene bags; take care to prevent contamination of the core barrels during storage or transportation.
- 8.2 Continue Core-Sampling Operations
 - 8.2.1 During assembly, a **field team member** shall secure the two pieces of the core barrel together by couplings at the top and bottom ends of the core barrel.
 - 8.2.2 **Field team members** shall decontaminate core-barrel equipment prior to introduction into the drill augers in accordance with SOP-01.08; ensuring to perform decon procedures with each use of the core-barrel sampler in the hole.
 - 8.2.3 **Field team members** shall attach the core barrel to either a drill rod or wireline system, lowering the core barrel through the augers to the bottom of the drill string; when finally deployed, the beveled or cutting edge of the core barrel protrudes just past the drill bit.
 - 8.2.4 **Field team members** shall connect the augers to the drill's drive head before drilling commencement.
 - 8.2.5 **Field team members** shall retrieve the core barrel when the augers advance to the appropriate sampling depth and the drilling is halted.
 - 8.2.6 With the anticipation of hazardous contaminants, **health and safety personnel** shall use portable field instruments to monitor the cuttings around the drill stem for radioactivity and VOCs, ensuring to signal when it is safe to remove the core barrel from the drill rig.
 - 8.2.7 **Field team members** shall carry the core barrel to the sample preparation area, taking off the screw fittings at the ends of the core barrel by using clamps mounted on a table or other acceptable mechanism.

- 8.2.8 If specified in the SSHASP, **health and safety personnel** shall monitor the core barrel ends to determine whether contaminants are present.
- 8.2.9 If contaminants detected, then the **health and safety personnel** shall take the appropriate action response as specified in the SSHASP.
- 8.2.10 When health and safety monitoring determines that no contaminants are present, **field team members** shall split open the core barrel, making the core available for examination and processing.

8.3 Handle Core Samples

Depending on the required, specific application or analyses, **field team members** shall handle the core in a variety of ways as described below.

8.3.1 Typical Core-Barrel Sampling Processes

8.3.1.1 Measure the entire core and cut into individual six-inch segments.

8.3.1.2 Examine the core segments, describe lithologically, and place in appropriate containers as prescribed in the site-specific Sampling and Analysis Plan (SAP).

Note: Process all core samples in accordance with procedures contained in SOPs-01.02, -01.03, and -01.04.

8.3.1.3 Place the core segment due submission for laboratory analysis (or several segments, if a composite sample is analyzed) in a stainless steel bowl and homogenize.

8.3.1.4 Then place aliquots of the homogenized sample in the appropriate sample container.

8.3.2 Sleeve-Contained Core Samples

8.3.2.1 Modify the above coring procedure, as necessary, by placing a series of six-inch stainless steel, brass, Teflon, or Lexan sleeves into the core barrel in order to capture and retain the sampled material.

Note: Use this procedure when cored materials are known or suspected to contain VOCs. The sleeves are pre-cut to length, labeled, and decontaminated prior to loading into the core barrel. All personnel handling the sleeves shall wear polyethylene gloves.

8.3.2.2 After an auger flight advancement the length of the core barrel, **health and safety personnel** shall open, trip out, and monitor the core barrel, as necessary; the sleeve-contained core is now available for sample processing.

8.3.2.3 Separate and remove the sleeves from the core barrel.

Note: When the sample is suspected to contain VOCs, seal the ends of each sleeve with a Teflon disc or tape and a plastic cap.

8.3.2.4 Individually place sleeve-contained cores requiring analysis for volatile and semivolatile organic compounds in a 12-by-12-inch, zip-lock bag, ensuring appropriate labeling and immediate storage in an ice chest in accordance with SOP-01.02.

9.0 LESSONS LEARNED

9.1 Before performing work described in this SOP, **RRES-RS Project participants** should go to the Department of Energy Lessons Learned Information Services home page, located at <http://www.tis.eh.doe.gov/II/II.html>, and/or to the LANL Lessons Learned Resources web page, located at http://www.lanl.gov/projects/lessons_learned/, and search for applicable lessons.

9.2 During work performance and/or after the completion of work activities, **RRES-RS Project participants**, as appropriate, shall identify, document, and submit lessons learned in accordance with the LANL, Lessons Learned System located at http://www.lanl.gov/projects/lessons_learned/.

10.0 RECORDS

All records generated as a result of core-barrel sampling procedures are identified in Section 10.0 RECORDS and in the attachments of SOPs-01.02, -01.03, and -01.04.

11.0 REFERENCES

To properly implement this SOP, **RRES-RS Project participants** should become familiar with the contents of the following documents located at http://erinternal.lanl.gov/home_links/Library_proc.shtml:

- RRES-RS Project, Quality Management Plan
- QP-2.2, Personnel Orientation and Training

- QP-4.4, Record Transmittal to the Records Processing Facility
- QP-5.7, Notebook Documentation for Environmental Restoration Technical Activities
- SOP-01.01, General Instructions for Field Investigations
- SOP-01.02, Sample Containers and Preservation
- SOP-01.03, Handling, Packaging, and Shipping of Samples
- SOP-01.04, Sample Control and Field Documentation
- SOP-01.06, Management of Environmental Restoration Project Wastes
- SOP-01.08, Field Decontamination of Drilling and Sampling Equipment

12.0 ATTACHMENTS

None

[Using a token card, click here to record "self-study" training to this procedure.](#)

If you do not possess a token card or encounter problems, contact the RRES-ECR training specialist.