Title	No.	Rev.
PHYSICAL PROCESSING AND STORAGE OF CORE AND CUTTINGS AT THE SAMPLE MANAGEMENT FACILITY	BTP-SMF-004	0
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1.0 PURPOSE AND SCOPE

This procedure describes the Yucca Mountain Project Office (Project Office) requirements and responsibilities for the physical processing and storage of Yucca Mountain Project (Project) core and cuttings at the Sample Management Facility (SMF).

2.0 APPLICABILITY

This procedure applies to Technical and Management Support Services (T&MSS) contractor personnel and support staff performing physical processing and storage of Project core and cuttings at the SMF.

3.0 DEFINITIONS

3.1 Sample Management (SM)

SM of the T&MSS contractor is the organization responsible for the collection, documentation, storage, and control of selected samples, remnants and records. SM includes the SMF and Field Operations. SM staff consists of management and operations personnel who ensure that SM operations and documentation satisfy applicable regulatory requirements.

3.2 Sample Management Facility

The SMF is the facility used for the documentation, storage, and control of samples and sample remnants collected and dispersed for analysis and evaluation by requesters. The SMF consists of a physical facility and equipment designed to effectively process and preserve collected samples. The SMF is operated by T&MSS contractor personnel for the Project.

3.3 Sample

A sample is part of a population whose properties are studied to gain information about the whole or group. Samples covered by this procedure include core and cuttings collected at Project field sites.

3.4 Core

A core is a cylindrical section of rock, or fragment thereof, taken as a sample of the interval penetrated by a core bit and brought to the surface for examination and/or analysis.

APPROVED BY

Assistant Project Manager	Date	YMP Branch Chief	Date	YMP Project Quality Manager	Date
John E. Shaler	6/20/89	R.E. Lyngdon for M.D. Blanchard	6/26/89		6/29/89

3.5 Cuttings

Cuttings are chips of rock produced during drilling that are removed from the borehole by circulation of drilling fluids (gas, foam, or liquid).

3.6 Archival-Research Borehole Sample Processing System

The archival-research borehole sample processing system of sample preservation is based upon splitting a representative sample of core or cuttings from the total collected sample, one of which is preserved as an archive (archival split), the other of which is available for research and analysis (research split). A critical factor in the application of this system is the availability of core of a certain minimum diameter (approximately 3.0"). The system in place at the SMF requires that the core be split longitudinally off-center, resulting in an approximately 1/3 archival split and 2/3 research split.

3.7 Whole Core Specimen

A whole core specimen is a subsection of whole core that constitutes the entire core sample recovered for the depth interval represented.

3.8 Curatorial Sample Inventory and Tracking System (CSITS)

The CSITS is the computer-based system designed to aid in the control and documentation of Project samples.

4.0 RESPONSIBILITIES

4.1 Curator

The Curator shall supervise SMF staff members performing physical processing and storage activities on borehole and other geologic samples. If authorized by the Curator after consultation with the SOC, the core will be moistened with a water spray to enhance the colors for photographic purposes.

4.2 Technical Staff Assistant (TS)

The TS Assistant shall ensure that activities performed during this procedure conform to quality assurance (QA) guidelines.

4.3 Sample Management Facility Geotechnician

The SMF Geotechnician will perform the following core processing and storage activities: sample splitting, placing in containers, labeling, subsampling, and storing. The SMF Geotechnician will conduct the following cuttings processing and

storage activities: cleaning of samples, bagging, placing in containers, labeling, subsampling, and storing.

4.4 Sample Management Facility Administrative Assistant

The SMF Administrative Assistant shall submit original QA records resulting from the implementation of this procedure to the T&MSS Local Records Center (LRC).

4.5 Reynolds Electrical & Engineering Company, Inc. (REECo)

REECo Teamsters and Laborers shall assist in handling and shelving of sample containers and will operate trucks and other material-handling equipment.

4.6 Sample Overview Committee (SOC)

The SOC is comprised of representatives from Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Sandia National Laboratories, the U.S. Geological Survey, SM. T&MSS, and the Project Office. It was formed to ensure a balance between Project sample needs, acquisition, and use, and the need to curate samples for posterity.

5.0 PROCEDURES

5.1 Introduction

Core and cuttings acquired from Project field sites shall be processed after arrival at the SMF. The purposes of processing these samples are: (1) to photo-document core, and (2) to achieve and maintain traceability on these samples acquired during Project site characterization activities. In addition to the purposes for processing, core greater than 3" diameter and cuttings will be divided (1) to prepare an archival split for future reference, and (2) to prepare a research split for scientific data-gathering activities. Samples will undergo different phases of processing, depending upon the condition of the sample and the analytical data to be derived. At the discretion of the Director of the Regulatory and Site Evaluation Division (RSED), Project Office, some core greater than 3" diameter will be left whole for analytical purposes or because it is too unconsolidated for slabbing. An archival split shall be cut from whole core or separated from cuttings (approximately 50 grams). The research split of core shall be photographed and placed in the appropriate storage location. At the discretion of the Curator, the archival split may be photographed in addition to or instead of the research split.

5.2 Core Processing

Requested whole core larger than 3" diameter that is selected by participants during a Core Examination Meeting (Project Office Branch Technical Procedure [BTP] BTP-SMF-005) shall be segregated from the rest of the core prior to slabbing. The

reserved whole core specimens held out from processing (BTP-SMF-006) shall have the approval of the RSED Director. Following verification of sample documentation (BTP-SMF-003) and selection and removal of whole core specimens, the remaining whole core will be slabbed, marked, packaged, and stored. Core less than 3" diameter will be verified, permantly marked, packaged, and stored.

5.2.1 Facilities

The core processing room will be equipped with electrical service, compressed air, running water, and drain lines with sediment traps.

5.2.2 Equipment

Core processing equipment will include, but is not limited to:

- Self-feeding core slabbing saws
- Work tables equipped with casters
- Measuring rules marked in tenths of a foot
- Dust collection system for dry slabbing
- Polyvinyl chloride (PVC) half-tubes
- Polyethylene lay-flat tubing
- Ear and eye protection
- Core marking supplies
- Polystyrene core cradles
- Pneumatic staple guns
- Core boxes

5.2.3 Core Slabbing Documentation

Information from CSITS will be used to generate one Core Slabbing/Boxing Checklist (Figure 1) per box to document the various steps in the slabbing process of whole core. The top portion of the checklist will include the borehole identification (ID) and other information specific to the core in that box (i.e., container interval, sample status). The lower portion of the Core Slabbing/Boxing Checklist will be divided into preslabbing and postslabbing sections and provides space for each activity in the process to be documented by the SMF Geotechnician performing it. During slabbing, the Core Slabbing/Boxing Checklist will be stored in a document cache mounted inside the lid of each box. Core that measures less than 3" diameter (small bore core) will not be slabbed. Individual steps in the Core Slabbing/Boxing Checklist that do not apply to small bore core will be marked "N/A" during core processing.

5.2.4 Core Box Preparation

5.2.4.1 Prior to the removal of the whole core from the field box in preparation for slabbing, another box of the same size will be constructed and include polystyrene cradles sized to fit the archival split of core. Polystyrene core status and whole core specimen markers will be placed in the research split box at the appropriate positions, and duplicates will be made and placed in the archival split box. Labels for these markers will be generated using information in CSITS. After the core from a field box has been slabbed, the field box will be used to hold the research split of core, and the newly constructed box will hold the archival split of core. Information from

CSITS will be used to generate five labels for each box, including borehole ID, box interval, and an index of sample interval statuses as they will exist immediately after slabbing (Figures 2 and 3). Labels will be affixed to both ends and one side of the core box lid and to both ends of the body of each archival or research split box. After all the core (excluding whole core specimens) from a borehole has been slabbed and boxed, a sequential box number will be laminated to the box (i.e., Box 3 of 246). Core less than 3" diameter will remain in the same box in which it was received from the field. Permanent labels for boxes containing 3" or less diameter core will contain the same information as the research core box labels.

5.2.4.2 The whole core (3" diameter or larger) will be removed from the field core box and placed one row at a time in PVC half-tubes fastened to a work table. Both the archival and research core box interiors will be marked at the top and bottom of each row to indicate the total depth interval represented in that row (i.e., core, missing core, whole core specimens removed, etc.).

5.2.5 Orientation Stripes and Depth Mark Finalization and Duplication

On core larger than 3" diameter, a second set of permanent orientation stripes will be placed 180° from the existing orientation stripes on the core. The blue footage indicator will be extended with a permanent marker to completely circumscribe the core. Depth indicators will be permanently marked in blue and appropriately located on both sides of the core (Figure 4). Core less than 3" diameter will have the temporary field markings replaced by permanent markings. These markings will not be duplicated as on core 3" diameter or larger.

5.2.6 Slabbing of Core

5.2.6.1 Approximately 3 ft of whole core (3" diameter or larger) from the work table will be placed in the core sawing jig with the top end to the operator's left and the original field orientation stripes facing outward toward the saw operator. The core shall be slabbed longitudinally into the approximately 1/3 archival split and 2/3 research split, each portion containing identical markings. The core will be slabbed with a diamond saw blade. Cores will be slabbed using water as the coolant/lubricant, or with a special dry-cutting sawblade. When the dry-cutting sawblade is used, a dust collection system will be used to control air quality within the saw room.

5.2.6.2 Rubble will be removed from the field transport bag and laid out on the work table. An approximate 1/3 - 2/3 diameter longitudinal split will be made on the rubble sample. Each split will be rebagged separately in 8" wide, 4-mil thick polyethylene lay-flat tubing, with a minimal amount of disturbance to the sample. Rubble from core less than 3" diameter will be bagged, but not split into archival and research portions. Each bag will be marked with orientation marks and depth indicators and placed in its respective box, row, and position.

5.2.7 Final Markings on Slabbed Core

After slabbing, the research split of core will be removed from the saw jig first, the archival split afterwards. Both splits of core will be laid out in the Core Processing Area, with the 1/3 and 2/3 splits placed face down, parallel to each other, and oriented correctly. Any markings that may have been obscured during slabbing shall be verified using the Core Status section of the Core Slabbing/Boxing Checklist (Figure 1) before being redrawn. The core will then be placed in its respective row and box.

5.2.8 Photography of Split Core

The core, whether newly slabbed (3" diameter or larger) or whole (less than 3" diameter), shall be photographed to record its initial condition, position in the box, orientation, and color. The Core Photography Log (Figure 5), used to document photography of the core, includes borehole ID, photographer's name and organization, film speed and f-stop, and date. Information on each exposure will include the following: exposure number, RCT (research) or ACT (archive) bar code number, box interval, missing footage status, and remarks. A Nevada Test Site (NTS) Support Contractor or the SMF staff shall be responsible for photographing the core. The SMF Geotechnician will complete this log as the photographs are taken and will initial and date the action.

5.2.8.1 Methods

5.2.8.1.1 The core and labeling cards will be arranged as shown in Figure 6. The borehole ID, RCT or ACT bar code number, box depth interval, date photographed, missing and whole core specimen interval markers, grey scale, and color scale will be displayed in each shot.

5.2.8.1.2 A box of research or small bore core will be placed with the shallower end of the interval in the lower left of the box stand. The box and photographic marquees will be outlined with tape to facilitate placement for subsequent shots. Labels will be in place to represent missing core and to explain discontinuous intervals (e.g., whole core specimens). If authorized by the Curator after consultation with the SOC, the core will be moistened with a water spray to enhance the colors. Core placement and camera focus shall be checked to ensure correct arrangement and legibility of labels. The SMF Geotechnician will record the exposure numbers, replace the core box lid, and remove the box from the box stand.

5.2.8.1.3 The developed exposures shall be examined by an SMF staff member to ensure that all boxes of core have been photographed and that the exposures are adequate to document the condition of the core. A list of any unsatisfactory or missing photographs will be made and the photographs will be retaken.

5.2.8.2 Handling and Archiving of Prints and Negatives

A minimum of three set of prints shall be maintained, one by the SMF Documents Center and two by the T&MSS LRC. The NTS Support Contractor or the SMF shall submit the original negatives to the T&MSS LRC. An index of each borehole photographic record will be kept in the resepective notebook.

5.2.9 Bagging of Archival Core

If bagging of the archival split is deemed necessary by the SOC, it will be sealed in polyethylene lay-flat tubing as soon as it has been marked and labeled. Lengths of lay-flat tubing will be cut for each core interval. One end of each length will be sealed with a heat sealer. One side of the tubing will be marked with the top and bottom depths of the core interval near the ends. Orientation marks, red on the right and blue on the left (Figure 4), will be drawn on the plastic bag. The approximately 3-foot section of core will be laid slabbed side face up on a contoured polystyrene cradle. The core and polystyrene cradle will then be inserted into the premarked lay-flat tubing, the excess air will be squeezed out, and the end of the tubing will be heat sealed. The sealed section of core will be placed in a protective cardboard divider pad and positioned in the archival split box. This process will be repeated for the other row in the box.

5.2.10 Sealing of Boxes

After core processing, containers will be sealed with filament tape and prepared for storage.

5.3 Cuttings Processing

Following verification of samples at the SMF (BTP-SMF-003), cuttings will be washed (if necessary), divided into archival and research splits, packaged, and stored.

5.3.1 Facilities

The cuttings processing room will be equipped with electrical service, compressed air, running water, and drain lines with sediment traps.

5.3.2 Equipment

Cuttings processing equipment will include, but is not limited to:

- Wemas automatic drill cuttings washer/dryer
- Work table equipped with casters
- Riffle type sample splitter
- Digital platform scale
- Storage boxes
- Storage vials
- Pneumatic stapler

5.3.3 Processing

A Cuttings Processing Log (Figure 11) will be used to document the various steps in processing the cuttings samples. The log contains the batch ID, borehole ID, container ID and interval, sample ID and interval of each bag, and a checklist delineating each stage of processing (i.e., wash/dry, split).

5.3.3.1 Washing and Drying

If the cuttings were produced by drilling with air, the samples will not be washed. If the cuttings were produced by drilling with drilling muds or air/foam, the samples will be washed.

5.3.3.2 Splitting

5.3.3.2.1 An archival split shall be taken from each cuttings sample received at the SMF. Cuttings will be split using a riffle-type sample splitter. The amount of sample taken for the archival split shall be up to 50 percent of the entire cuttings sample, not to exceed 50 grams. The archival cuttings sample will then be placed into a prelabeled plastic vial with screw caps. Each vial will have a label affixed denoting borehole ID, sample interval, and ACT bar code number of that sample. The plastic vial will be kept in a storage box containing other archival cuttings samples within the storage box sample range.

5.3.3.2.2 The research cuttings sample split, which will not exceed 200 grams, will be kept in plastic vials with screw caps. Each vial will have a label affixed denoting borehole ID, sample interval, and RCT bar code number of that sample. Principal Investigators requiring amounts of cuttings greater than 200 grams shall collect them at the borehole site and then submit a Sample Collection Report (BTP-SMF-007) to the SMF. SM Geotechnicians can also collect the cuttings for the investigator and document this on a Sample Collection Report.

5.3.3.3 Packaging and Labeling

Vials containing the research and archival splits of cuttings will be stored in separate boxes. The borehole ID, container interval, RCT or ACT bar code number (if applicable), and missing footage within that container (if applicable) will be entered into CSITS. Four permanent label types will be generated using information contained in CSITS with the aforementioned information contained on them: an Archival Sample vial label (Figure 7), a Research Sample vial label (Figure 8), an Archival Sample storage box label (Figure 9), and a Research Sample storage box label (Figure 10). Boxes will be sealed with filament tape.

5.4 Sample Storage

A Sample Container Storage Log (Figure 12) is generated using information contained in CSITS and includes the borehole ID, sample type, and RCT or ACT bar code

number. The SMF Geotechnician placing the sample container in storage will enter the storage location and the date the container was shelved into the Sample Container Storage Log. The SMF Geotechnician and the TS Assistant shall both sign and date this record. The storage location of each container will be entered into CSITS. The storage areas shall be access-limited.

5.4.1 Core Sample Storage

The 1/3 and 2/3 diameter splits of the processed core, as well as the small bore core, will be shelved separately by acquisition site and location ID system. The 1/3 diameter archival split will be stored in the Archival Core Storage area of Building 4221, while the 2/3 diameter research split and the small bore core will be stored in Building 4320.

5.4.2 Cuttings Storage

Both the archival and research cuttings sample splits will be stored in the bulk sample storage area in Building 4320.

5.5 Identification and Resolution of Discrepancies

A discrepancy exists when there is incorrect information that significantly affects documentation or notation that is beyond the scope of the immediate activity or form being completed. Any discrepancies shall be resolved upon discovery by crossing through the error, correcting it in the original document, and initialing and dating the correction. If the correction is not self-explanatory, the individual shall assign a number to the correction and attach a sheet to the original record that fully describes the correction performed. Discrepancies discovered after an activity or form has been completed will be handled according to the procedure outlined in BTP-SMF-001, Section 5.7.4.

5.6 Nonconformance Reporting

A nonconformance exists when there is a deficiency in characteristic, documentation, or procedure that renders the quality of an item or activity unacceptable or indeterminate. The intent of nonconformance reporting is to assure the resolution of the conditions not meeting the requirements or to assure that undefined conditions are defined. If there are any nonconformances to this procedure noted during or after associated activities, SMF staff members shall report them to the Project Quality Manager or another individual in the Project Office QA organization. Segregation of a nonconforming item or termination of a nonconforming activity will be done according to Quality Management Procedure (QMP) QMP-15-01.

6.0 REFERENCES

BTP-SMF-001, Sample Management for the Yucca Mountain Project.

BTP-SMF-003, Verification of Field Logging and Documentation of Core and Cuttings.

BTP-SMF-005, Examination of Samples by Participants at the SMF.

BTP-SMF-006, Removal of Whole Core and Other Specimens from Samples for Shipment and Remnant Return.

BTP-SMF-007, Acceptance for Curation by the SMF of Selected Samples and Documentation.

BTP-SMF-008, Field Logging and Documentation of Borehole Samples.

QMP-15-01, Rev. 1, Control of Nonconformances.

7.0 FIGURES

Figure 1 - Example of CSITS-generated Core Slabbing/Boxing Checklist.
Figure 2 - Example of CSITS-generated Core Box Label for Research Split.
Figure 3 - Example of CSITS-generated Core Box Label for Archival Split.
Figure 4 - Example of Core Markings.
Figure 5 - SMF Core Photography Log.
Figure 6 - Core Photographic Format.
Figure 7 - Example of CSITS-generated Vial Label for Cuttings Archival Sample.
Figure 8 - Example of CSITS-generated Vial Label for Cuttings Research Sample.
Figure 9 - Example of CSITS-generated Archive Cuttings Container Label.
Figure 10 - Example of CSITS-generated Research Cuttings Container Label.
Figure 11 - Example of CSITS-generated Cuttings Processing Log.
Figure 12 - Sample Container Storage Log.

8.0 QA RECORDS

The SMF Administrative Assistant shall ensure that the following QA records resulting from implementation of this procedure are turned over to the T&MSS LRC. Copies of these QA records will be retained by the SMF and stored at the SMF Documents Center.

1. Core Slabbing/Boxing Checklist.
2. SMF Core Photography Log.
3. Cuttings Processing Log.
4. Sample Container Storage Log.
5. Core Photographs.

CORE SLABBING/BOXING CHECKLIST

Batch: RAT : BAT43

Borehole: SCORE : BHL141

Container

Specifier: FCT100003
Top Depth: 50.0
Bot Depth: 75.0

Sample Status

50.0 to 60.0 : REC
60.0 to 62.5 : WCR
62.5 to 75.0 : REC

Remarks: _____

CORE SLABBING CHECKLIST

	Archival	Research
Labels Affixed to Boxes?	✓	✓
Duplicate Orientation Marks Drawn?	✓	✓
Depth Markers Extended Around Core?	✓	✓
Duplicate Footage Markers Drawn?	✓	✓
Rubble Split and Bagged?	✓	✓
Missing Footage Markers Inserted?	✓	✓
Whole Core Removed Markers Inserted?	✓	✓
Core Slabbed?	✓	✓

CORE BOXING CHECKLIST

	Archival	Research
Tubing Marked with Depth and Orientation?	✓	N/A
Core Placed In Polystyrene Cradle?	✓	✓
Cardboard Liner In Place?	✓	✓
Archive Core Placed In Lay-flat Tubing?	✓	N/A

George Donaldson — SMF Geotechnician — 7/1/89 Date

Chris Kwan — TS Assistant — 7/1/89 Date

George Donaldson — SMF Geotechnician — 7/1/89 Date

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Figure 1. Example of CSITS-generated Core Slabbing/Boxing Checklist.

YUCCA MOUNTAIN PROJECT
RESEARCH CORE SAMPLES
BOREHOLE: YMP-AC1 BHL10005
INTERVAL: 0.0 TO 46.0

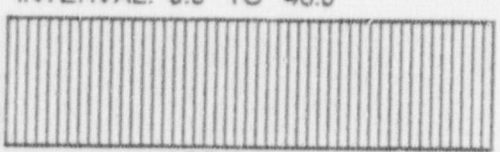
RCT00000203

STATUS:

0.0 to 40.0 : NAT
40.0 to 46.0 : REC

Figure 2. Example of CSITS-generated core box label for Research Split.

YUCCA MOUNTAIN PROJECT
ARCHIVE CORE SAMPLES
BOREHOLE: YMP-AC1 BHL10005
INTERVAL: 0.0 TO 46.0



ACT00000203

STATUS:

0.0 to 40.0 : NAT
40.0 to 46.0 : REC

Figure 3. Example of CSITS-generated core box label for Archival Split.

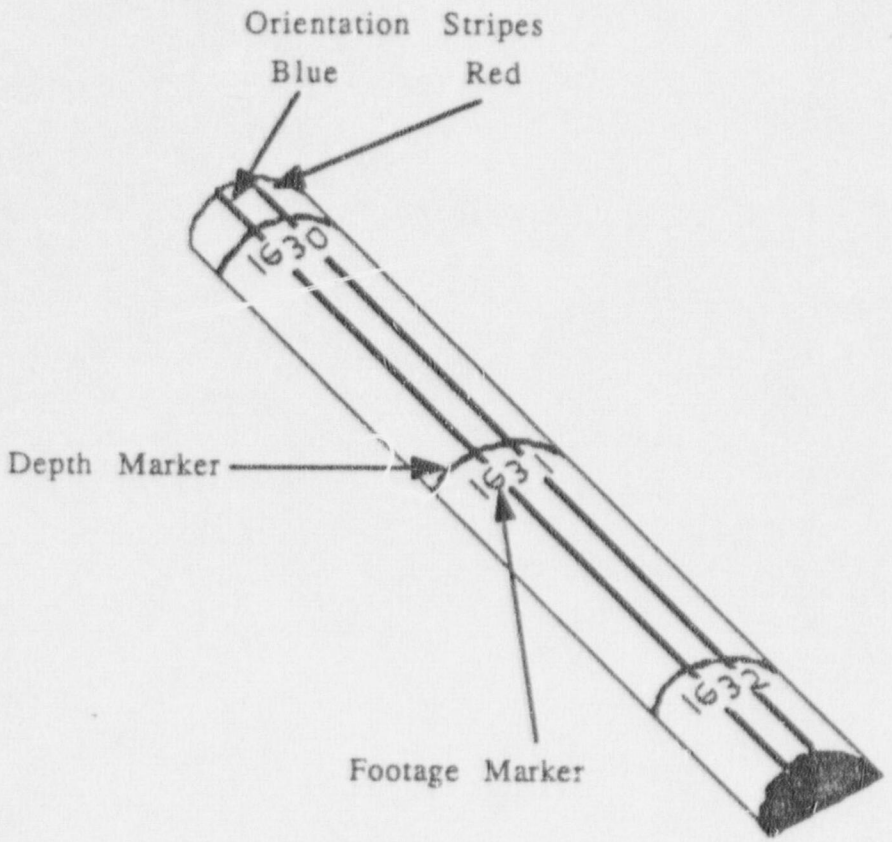


Figure 4. Example of Core Markings.

YUCCA MOUNTAIN PROJECT SAMPLE MANAGEMENT FACILITY

SMF CORE PHOTOGRAPHY LOG — BTPSMF4-1 5/89

Borehole I D ____________ Photographer ____________ Organization ____________

Film Speed ____________ f-stop ____________ Date ____________

Expo-sure#	RCT/ACT Bar Code #	Box Interval	Missing Footage		Remarks
			Interval	*Expl	

NAT - Not Attempted
LOST - Lost
DES - Destroyed
CON - Consumed
UNREC - Unrecvd.

SMF Geotechnican ____________ Date ____________

TS Assistant ____________ Date ____________

Figure 5. SMF Core Photography Log.

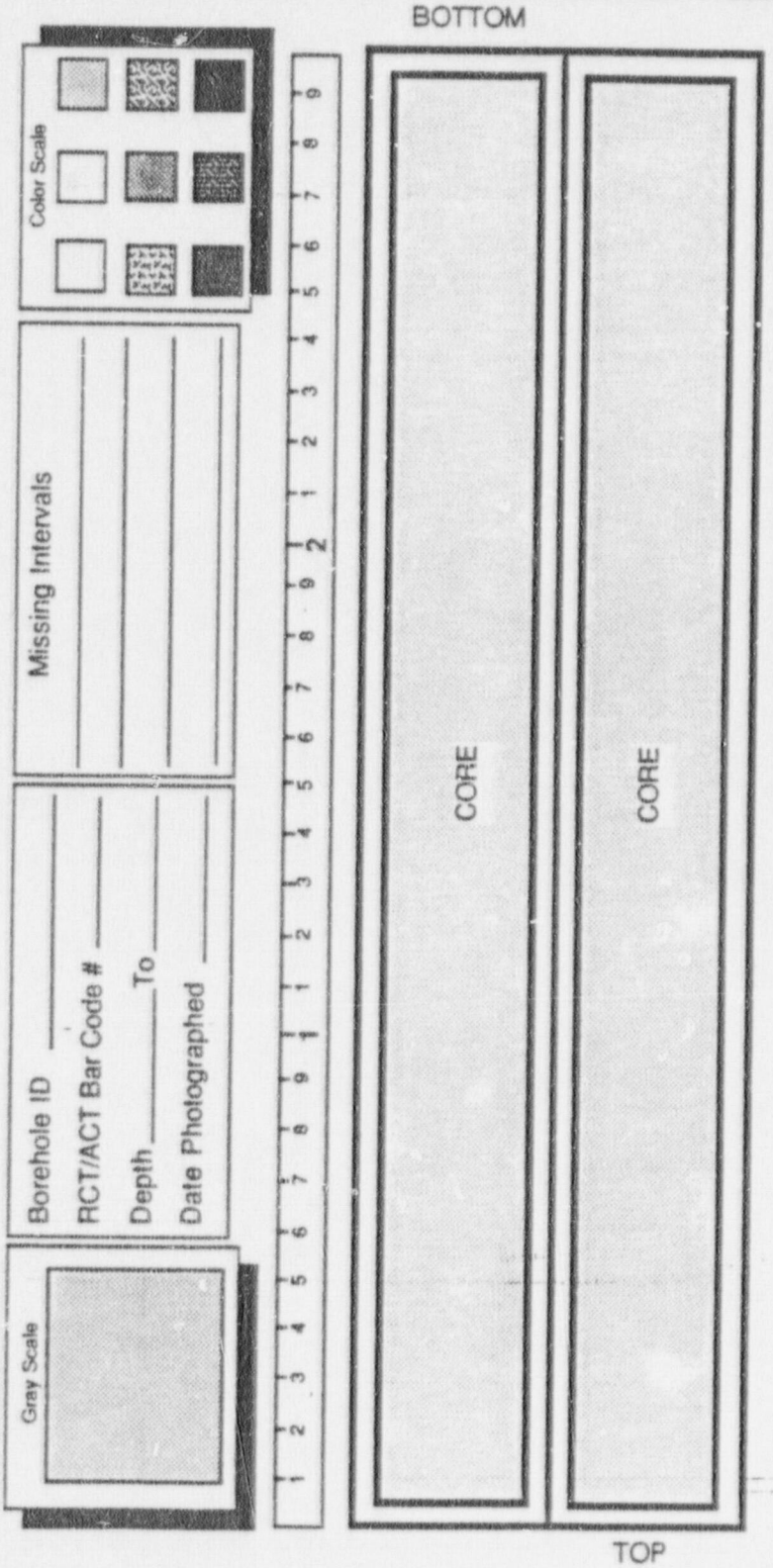


Figure 6. Core Photographic Format.

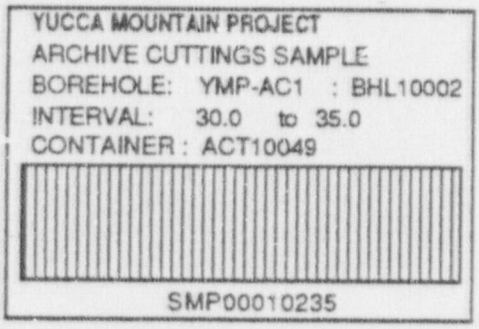


Figure 7. Example of CSITS-generated Vial Label for Cuttings Archival Sample.

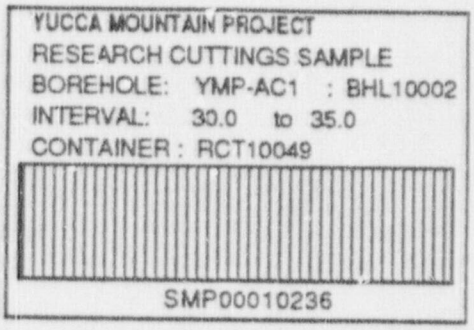


Figure 8. Example of CSITS-generated Vial Label for Cuttings Research Sample.

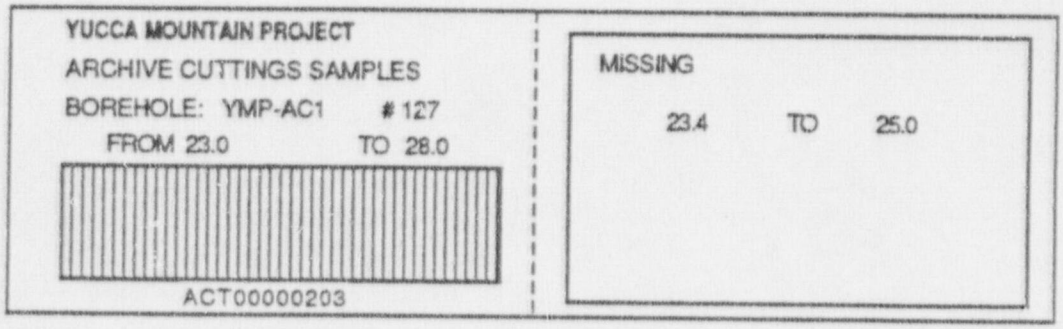


Figure 9. Example of CSITS-generated Archive Cuttings Container Label.

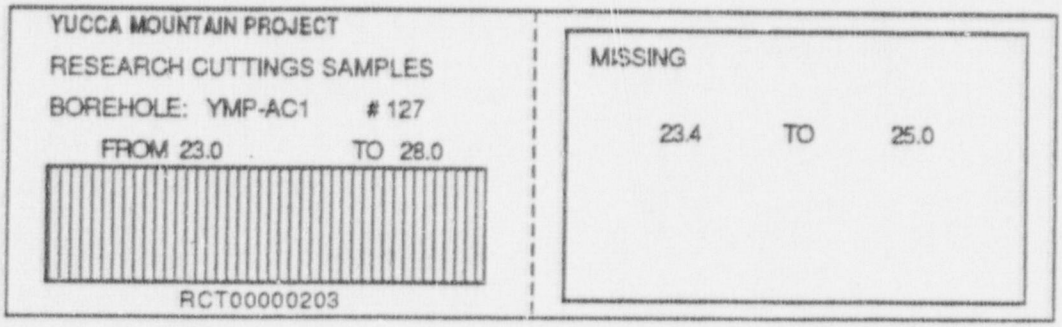


Figure 10. Example of CSITS-generated Research Cuttings Container Label.

Title: PHYSICAL PROCESSING AND STORAGE OF CORE AND CUTTINGS AT THE SAMPLE MANAGEMENT FACILITY

CUTTINGS PROCESSING LOG

Batch: CUTPROC : BAT62
Borehole: YMP-AC2 : BHL143

Container

Specifier: FCT000319 Top: 238.7 Bot: 350.0

Sample			Wash/Dry	Split	Packaged	Labeled
Specifier : SMP00000382	Top: 238.7	Bot: 300.0	✓	✓	✓	✓
Specifier : SMP00000383	Top: 300.0	Bot: 350.0	✓	✓	✓	✓

George Donaldson 6/20/89
SMF Geotechnician Date

Chuck Lewis 6/20/89
YS Assistant Date

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Figure 11. Example of CSITS-generated Cuttings Processing Log.

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YUCCA MOUNTAIN PROJECT SAMPLE MANAGEMENT FACILITY

SAMPLE CONTAINER STORAGE LOG — BTPSMF4-2 5/89

Borehole I.D	Sample Type	RCT/ACT Bar Bode #	Storage Location	Placed By	Date

SMF Geotechnician ____ Date ____ TS Assistant ____ Date ____

Figure 12. Sample Container Storage Log.