BTP-SMF-004: REV1 DRAFT

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

NOTES

This "Information Copy" indicates changes made to BTP-SMF-004 Rev 0, (approved 7/7/89) as a result of experience gained processing prototype core from Utah. All changes have been italicized in this copy.

KEY:

(+) Means the preceding phrase has been added to the original
(-) Means the peceding phrase has been deleted from the original
(#) Means the peceding phrase has been changed from the original

Some explanations regarding changes have been included.

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

BTP-SMF-004 Rev1

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.

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.

3.9 Large Diameter Core

A large diameter core is a core section 3" or more in diameter. (+)

3.10 Small Diameter Core

A small diameter core is a core section less than 3" in diameter. (+)

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

The SOC is responsible for deciding the need to split core samples into archive and research portions on a borehole by borehole basis. The SOC Chairman will notify the Curator of this decision prior to the physical processing of each borehole. (+) 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 photodocument core, and (2) to achieve and maintain traceability on samples acquired during Project site characterization activities. In addition, *some large diameter core* (#) and cuttings will be divided to (1) prepare an archival split for future reference, and (2) 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...* (-) The research split of core shall be photographed and placed in an appropriate storage location. At the discretion of the Curator, the archival split may be photographed in addition to or instead of the research split. **- - Clarifies the responsibilities for determining the type of processing to be done on core.**

5.2 Core Processing

Requested whole *large diameter core* (#) 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. *Small diameter core* (#) 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
Ear and eye protection
Core marking supplies

Measuring rules marked in tenths of a foot
Dust collection system for dry slabbing
Polyvinyl chloride (PVC) half-tubes
Polyethylene lay-flat tubing
Polystyrene core cradles
Pneumatic staple guns
Core boxes

5.2.3 Core Processing 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 *processing* (#) 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... (-) Small diameter core* (#) will not be slabbed. Individual steps in the Core Slabbing/Boxing Checklist that do not apply to small *diameter* (#) core will be marked "N/A" during core processing.

5.2.4 Core Box Preparation

5.2.4.1 Prior to the removal of whole core from the field box in preparation for slabbing, an *identical box will be constructed and fitted with polystyrene cradles sized to fit the archival split of core. The field box will be used to hold the research split , and the newly constructed box will hold the archival split of core. Matching polystyrene 'Core Status' and 'Whole Core Specimen Removed' markers will be placed in both boxes at the appropriate positions. Small diameter core will remain in the same box in which it was received from the field. The appropriate core processing utility in CSITS will be run, and permanent labels, five for each box, will be generated. The label information will include borehole ID, box interval, and an index of sample interval status as it will exist immediately after slabbing or conversion (Figures 2 and 3). Labels will be affixed to both ends and one side of each core box lid and to both ends of the base of each box. After all core from a borehole has been processed, a sequential box number will be laminated to the box (i.e., Box 3 of 246). Permanent labels for small diameter core will be identical to research container labels.* (#) **--Instructions clarified and expanded to reflect actual order of operation.**

5.2.4.2 Core will be removed from the field container and placed one row at a time into cradles. The interiors of both archive and research containers will be marked at the upper and lower ends to indicate the total depth interval represented on that row, including missing intervals, whole core specimens removed, etc. (#) **--Reworded both to streamline operation and to apply step to all core sizes.**

5.2.5 Orientation Stripes and Depth Mark Finalization and Duplication

The blue footage indicator will be extended with a permanent marker to completely circumscribe the core. On large diameter core, a second set of permanent orientation stripes will be placed 180° from the existing orientation stripes. Depth indicators on large diameter core will be permanently marked in blue and located on both sides of the core (Figure 4). (#) **--Streamlined and clarified**

5.2.6 *Core Slabbing* (#)

5.2.6.1 *One row of large diameter core will be removed from the cradle and* (#) 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 approximately 1/3 archival split and 2/3 research split, each portion containing identical markings. *If an interval of core is highly fractured or otherwise in such a condition that it is unlikely to withstand slabbing, it may be stabilized to aid in maintaining its integrity during slabbing.* (+) *The core will...* (-) *Core may* (#)be slabbed using water as coolant/lubricant, or with a special dry-cutting blade. 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 *small diameter core will be rebagged, but not split.* (#) Each bag will be marked with *depth indicators and borehole ID,* (#) and placed in its respective box, row, and position. **-- Reference to orientation mark removed, borehole ID added.**

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, *face down and oriented identically.* (#) 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 *Core Photography* (#)

The *newly processed core* (#) shall be photographed to record its initial condition, position in the box, orientation, and color. The Core Photography Log (Figure 5), *will be used to document photography of the core, and will include* (#) borehole ID, photographer's name and organization, film speed and f-stop, and date. Information on each exposure will include the following: exposure number, container ID number, box interval, missing footage status, and remarks. A Nevada Test Site (NTS) Support Contractor or the SMF staff will 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, Container ID 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 *Boxes to be photographed will be placed with the top of the interval in the lower right of the box stand.* (#) The box and photographic marquees will be outlined with tape to facilitate placement for subsequent shots. *Labels will...* (-) If authorized by the Curator after consultation with the SOC, the core will be moistened with a water spray to enhance the *visibility of details.* (#) Core placement and camera focus shall be checked to ensure correct arrangement and legibility of labels. The SMF Geotechnician will record the exposure numbers *before removing* (#) the box from the box stand.
- - Changes correct inaccuracies in paragraph.

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 *those boxes rephotographed.* (#)

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, *each row of core in a box* (+) 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 *tubing between depth marks.* (#) The *approximately...* (-) core will be laid with the slabbed 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.

5.2.10Sealing 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). *Permanent labels, five for each box, will be generated. The label information will include borehole ID, box interval, and an index missing footage within that container. Labels will be affixed to both ends and one side of each core box lid and to both ends of the base of each box. After all cuttings from a borehole have been processed, sequential box numbers (i.e., Box 3 of 246) will be laminated to the boxes.* (+)

5.3.3.1 Washing and Drying

Cuttings produced by dry-drilling will not be washed. Cuttings produced by drilling with fluids will be washed. (#) *Dry-drilled cuttings that are wet or clogged with clay matrix may be dried and disaggregated to ease subsequent splitting.* (+)

5.3.3.2 Splitting

Each cuttings sample received at the SMF will be split into an archival and research portion. (#) Cuttings will be split using a riffle-type sample splitter. *Before splitting, excessively large particals shall be filtered out and discarded.* (+) The amount of sample taken for the archival split may be up to 50 per cent of the(*entire* (-)) cuttings sample. (*not to...* (-)) The archival cuttings sample will be placed into a prelabeled *2-ounce screw-capped plastic vial.* (#) *The research cuttings sample split will be kept in a prelabled 6-ounce screw-capped plastic vial. Material in excess of what is required to fill the archive and research sample vials will be discarded.* (+) Each vial will have a label affixed denoting borehole ID, *sample ID, sample interval, and archive or research storage box number for the* (#) sample. **- -Reworded to clarify actual operation, streamlined by combining 5.3.3.2.1 and 5.3.3.2.2 into a single paragraph, weight limits for cuttings samples removed.**

5.3.3.3 Packaging*and...* (-)

Vials containing the research and archival splits of cuttings will be stored in separate *preassigned* (+) boxes. *The borehole...* (-) 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 container ID 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 Quality Management Procedure (QMP) QMP-17-01 Section 5.7.

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-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.

QMP-17-01, Rev. 1, Records Management: Record Source Implementation

7.0 FIGURES

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 within 10 business days of completion. 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.