

TEST AND OPERATIONS PROCEDURE			
Title CHIP SAMPLE COLLECTION AND PREPARATION OF BOREHOLE GEOLOGIC LOG FOR CABLE TOOL DRILLING			Number GT-ES-104
Preparing Org. HYDROGEOLOGIC TESTING DEPARTMENT	Issue Date JUN 12 1987	Rev. 0	Page 1 of 13

1.0 PURPOSE

This procedure describes the method of collection and verification of cable tool samples and the method of completion, review, approval, additions, and records storage of the Borehole Geologic Log for the Basalt Waste Isolation Project as required by applicable Borehole Test Plan. The purpose of this log is to provide preliminary stratigraphic information as a result of drilling.

2.0 APPLICABILITY

This procedure applies to cable tool sample collection and related logging activities for completion of the Borehole Geologic Log when specified in the applicable Borehole Test Plan.

3.0 SAFETY

Overall safety requirements are per Rockwell Hanford Operations Master Safety Rules (RHO-MA-119) and Accident Prevention Standards (APS) (RHO-MA-221). Personnel should be familiar with the Pre-job Safety Plan developed for drilling operations as required by RHO-MA-221, APS #2, as well as APS #30 on drilling safety and the International Association of Drilling Contractors Accident Prevention Manual. The safety plan and the manuals mentioned above are on file in the Site Characterization Field Investigation (SCFI) Technical Files.

Site Geologists are frequently required to be near the drill rig during cable tool operations to document drilling parameters and transport samples.

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Hazards encountered by geologists at this time include but are not limited to:

- Hazardous moving equipment
- Overhead hazards
- Noise hazards
- Tripping and slipping hazards.

Geologists can minimize their exposure to these hazards by minimizing the time spent near the rig and being fully alert and aware of their surroundings at all times.

Geologists should also avoid tripping hazards such as hoses, pipes, and equipment on or near the drill rig.

The Pre-Job Safety Plan (see APS #2) requires the identification of hazards and the training of personnel in minimizing the hazards encountered.

Individual geologists are responsible for properly wearing personnel protective equipment (see APS #11). Hard hats and safety shoes will be worn at all times when working inside the area bounded by the guy wires, or within 50 ft of the drill rig (if guy wires are not present). Safety glasses are required when working in areas with the potential for flying particles.

Immediately report accidents or unsafe conditions to the Site Drilling Engineer, Manager, or Safety representative. Emergency procedures are posted at all well sites.

4.0 REQUIREMENTS

4.1 RESPONSIBILITIES

4.1.1 Manager, Geologic Testing Group

The Manager, Geologic Testing Group (GTG) is responsible for assigning qualified Site Geologists and Technical Reviewers to complete and review Borehole Geologic Logs. This Manager is also responsible for verifying that the Borehole Geologic Logs are technically reviewed and copies transmitted to the Basalt Records Management Center (BRMC) per section 8.0 of this procedure.

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The Manager will also assign a chip sample collector via internal letter to collect samples according to this procedure and applicable test plan.

4.1.2 Site Geologist

The Site Geologist is assigned direct responsibility by the Manager, GTG, for the completion of the Borehole Geologic Log described in this procedure. The Site Geologist is also responsible for verifying that cable tool samples are gathered in accordance with this procedure and applicable test plan. The Site Geologist will notify the Site Drilling Engineer if samples are not collected according to this procedure.

4.1.3 Site Drilling Engineer

The Site Drilling Engineer is assigned direct responsibility for documenting corrective action when samples are not collected according to procedure or not acceptable.

4.1.4 Technical Reviewer

A qualified Technical Reviewer is assigned by the Manager, GTG, and is responsible for verifying that data contained on the log are properly entered and documented as required in this procedure.

4.1.5 Chip Sample Collector

Chip sample collectors are assigned by internal letter by the Manager, GTG, and are responsible for collecting cable tool samples as required by this procedure and applicable test plan.

4.2 QUALIFICATIONS

4.2.1 Site Geologist

Site Geologists responsible for preparation of the Borehole Geologic Log are required to have minimum or equivalent qualifications of a Bachelor of Science (B.S.) degree in geology, engineering geology, or earth science. Qualification records are to be entered in the SCFI Department personnel qualification file. Geologists are given training specific to use of this procedure in the geologist training for cable tool drilling. Completion of this program is documented by internal letter. A copy of the letter is maintained in the SCFI Department qualification file.

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4.2.2 Technical Reviewer

Personnel reviewing the log must have qualifications at least equivalent to a cognizant geologist as defined above in 4.2.1. The reviewer must not have been involved in preparing the original log.

4.2.3 Chip Sample Collector

Personnel collecting cable tool samples shall be trained in sections 1.0, 2.0, 3.0, 4.1.4, 4.2, and 6.1 of this procedure. This will be documented and a copy of the record maintained in the SCFI Department files.

4.3 DATA COLLECTION

The data collected during or after borehole drilling is compiled on the Borehole Geologic Log, form 80-6400-073.2 (R-4-80) (fig. 1). The type of data gathered is described in section 6.0 of this Test and Operations Procedure and includes: 1) a summary description chip samples; 2) a preliminary interpretation of flow and sediment contacts; 3) engineering parameters such as, penetration rates when required and hole and casing diameter; and 4) depth of water table, if applicable. The scale of the logging is usually 1-in. = 10 ft.

4.4 TECHNICAL REVIEW

A Technical Reviewer reviews each page of the completed log as per this procedure. The reviewer addresses the following considerations by using the log and any other available source data, such as cable tool samples:

- Is the procedure being followed
- Are the interpretations and judgments made in the log sound and defensible, particularly in such key elements as unit contacts, lithologic descriptions
- Are all possible data entries complete?

The reviewer indicates favorable review action by completion of the "Reviewed and Approved" block (sign and print name, title, date) (fig. 2). Additional comments may be added to the lithology section by the Technical Reviewer who shall sign and date the addition. Logs found to be unacceptable are returned to the Site Geologist for correction and/or revision.

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5.0 PREREQUISITES

5.1 EQUIPMENT

The following is a list of the equipment utilized for completion of the Borehole Geologic Log:

- American Geological Institute (AGI) Data Sheets, 1982
- Geological Society of America (GSA) Rock Color Chart, 1982
- Hand magnifier (5-7 magnification) with an internal millimeter scale
- Millimeter scale
- Hydrochloric acid (HCl)

Control/calibration of this equipment is per Project Management Procedures Manual (PMPM) 7-108.

6.0 PROCEDURE

6.1 GEOTECHNICAL SAMPLES

6.1.1 Sample Collection and Control

Unless otherwise specified in the applicable test plan, samples are collected as follows by an assigned chip sample collector:

- Samples are collected at five foot intervals from cuttings retrieved by the bailer
- Samples will remain unwashed and be placed in jars while drilling suprabasalt sediments. Containers are labeled on both the jar and lid using black permanent ink with the borehole number, date and footage interval. The sampler will also, print name, sign and date the label on the sample container
- After intersecting the first basalt flow, samples are placed in sample bags. Bags are labeled with the borehole number, date, and footage interval using permanent black ink. The sampler will also print name, sign, and date the bag. This can be done on the front or back of the label

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- The samples are stored in sequential order in a suitable place (e.g., truck) to be protected from damage or loss.
- The Site Geologist completes an entry in the controlled notebook stating the footage interval of the samples collected and transported and indicate if all samples are accounted for and properly labeled. The Site Geologist signs, prints name and title, and dates entry
- The Site Geologist transports the samples from the borehole site to a secure storage facility on a daily basis. The sample will then be logged according to this procedure by the Site Geologist. When the samples are left unattended by authorized personnel, the facility shall be locked
- Samples are periodically shipped (usually once a week) to the Hanford Geotechnical Library (HGSL) per PMPM 8-110
- Verification of the sampling procedure and transfer of samples is the responsibility of the Site Geologist.

6.1.2 Sample Acceptance

Samples are to be labeled as in 6.1.1 above, collected as scheduled and be as representative of borehole conditions as possible. Once each day the Site Geologist will verify that the samples have been collected and that the labels are complete. The Site Geologist also verifies that the footage interval of the last sample is consistent with the borehole depth as shown on the Shift Report of Operations (SRO).

Once each week, the Site Geologist will observe the chip sample collector sampling, for each shift, for compliance with applicable test plans, for compliance with applicable test plan.

Verification actions are recorded in the controlled notebook. The Site Drilling Engineer is to be notified if samples are not acceptable or the procedure is not being followed. Immediate corrective action is to be taken and documented on the SRO by the Site Drilling Engineer. Nonconformance Report will be generated per PMPM 4-105, as required.

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6.2 ENTRIES ON BOREHOLE GEOLOGIC LOG

6.2.1 Entries

Make all entries on the Borehole Geologic Log in reproducible black ink. Entries must be legible and complete. Spell out abbreviations at first use. Errors/revisions are to be marked through with a single line, initialed, and dated by the responsible party (see PMPM 8-105). Reviewer's additions and/or comments are to be initialed and dated by the reviewer. All data columns are to have entries applicable to the data being recorded. Entries in section 6.2.2 and 6.2.3 do not have to be made in the order listed.

Data entered in an entry category applies to subsequent entries when indicated by a vertical continuation line. The line may be terminated by a horizontal cross-line. Entry of "NC" for "not calculable" in any data column or category indicates that no calculation or measurement was possible based upon the data available. Entry of "NA" in any data column or category indicates that the particular data category was "not applicable."

6.2.2 Heading

Complete heading blocks as follows (see fig. 2).

1. Well No. Enter unique well number assigned, e.g., DC-16.
2. Logged, Title, Date. The Site Geologist completing the Borehole Geologic Log signs and prints name, enters date, and completes the "Title" block as each page is completed.
3. Review and Approval, Title, Date. The Technical Reviewer reviewing the Borehole Geologic Log signs and prints name, enters date, and completes the "Title" block as each page is reviewed.
4. Revised, Title, Date and Revisions Approved, Title, Page. These blocks are completed after revisions (if required) are made. Complete the blocks in the same manner as the original logging and review blocks.

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5. Scale: 1-in. = _____ and Page _____ of _____. Self-explanatory; normal scale is 1-in. = 10-ft. Page number is entered consecutively for each page and after completion of the borehole log for total page number. Also, enter the procedure and revision numbers.
6. Enter this procedure and revision number below "Borehole Geologic Log" (see fig. 2).

6.2.3 Drilling Information and Lithology

Enter required information as follows.

1. Hole Diameter and Core Diameter. Enter this information on every page. Information applies as of the time of log preparation. Enter "NA" under "Core Diameter" for cable tool operations.
2. Casing Diameter at Date Completed. Self-explanatory; enter "NA" if borehole is not cased at depth logged. This entry can be left blank until completion of the borehole if casing is to be installed prior to completing the borehole to total depth.
3. Scale: 1-in. = _____, and Depth Below Ground Surface. Scale is the same as 5 of subsection 6.2.2, above. Depth below ground surface is in feet and is entered at the first through sixth weighted lines. Enter "NA" under meters.
4. Run NR, ROD, % Recovery, and Box NR. Enter "NA" in these columns because entries are not applicable to cable tool drilling.
5. Weight on Bit Pounds x 10³. Enter "NA" in this column because entries are not applicable to cable tool drilling.
6. Drill Rate Ft/H. Enter a graphic representation of the penetration rate in feet per day (ft/day) (see fig. 2). Enter "NC" across the category if data is not available. Enter "NA" if drill rate not required in Borehole Test Plan.
7. Graphic Log. Provide a summary graphic depiction of chips or sediment samples where possible. Enter "NC" if no graphic description is possible. See figure 3 for graphic symbols to be used.

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8. Lithology. Provide a summary lithologic description where possible of the geologic material described; chips or sediment samples. Descriptions should apply to discrete drilled or sampled intervals.

Descriptions will vary according to the type of samples collected, however, the lithographic description should include as a minimum: rock type, dominant rock color (by comparison with the AGI Rock Color Chart), grain size, grain or clast composition (if visible), sorting, (by comparison to Compton, 1961, pg. 214) and roundness (by comparison to the AGI Data Sheet).

If samples are not available or are not representative, enter "NC" and provide a reason for no data, e.g., example, "NC--no returns."

This log is a preliminary documentation of the stratigraphic relationships derived from the borehole. Such comments as contact depths, and zones of fluid loss should also be entered under lithology when known. See figure 2 for an example of a completed Borehole Geologic Log.

6.2.4 Revisions

Revisions to original logs are to be initialed and dated by the geologist making the revisions (per PMPM 8-105). Such revisions must be reviewed by a Technical Reviewer. The revising geologist and reviewer are to complete the identification blocks as required in section 6.2.2, number 4, of this procedure.

7.0 CALCULATIONS/COMPUTATIONS.

Not applicable to this procedure.

8.0 RECORDS

As outlined in this procedure, the Borehole Geologic Log, form BD-6400-073.2 (R-4-80), (fig. 1), is used in compiling geotechnical data and drilling parameters obtained and collected from borehole drilling. The original log is maintained in the Hydrogeologic Testing Department (HTD) Borehole Files. A copy is furnished to the BRMC (per PMPM 8-103) after completion and review of the logs.

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Samples are routinely transferred to the HGSL as per PMPM 8-110. In addition to the documentation described in PMPM 8-110, a copy of the transfer form is maintained in the HTD Borehole Files.

9.0 REFERENCES

AGI Data Sheets, American Geological Institute, Fall Church, Virginia, 1982

Compton, Roberts R., Manual of Field Geology, John Wiley and Sons, New York, New York, 1962

GSA Rock Color Chart, Geological Society of America, Boulder, Colorado, 1982

Manual of Drilling Fluid Technology, NL Baroid Petroleum Services/NL Industries, Houston, Texas, 1979

RHO-BW-MA-17, Project Management Procedure Manual, Basalt Waste Isolation Project

PMPM 4-105, "Nonconformance Reports"

PMPM 7-108, "Control of Standards and Measuring and Test Equipment"

PMPM 8-103, "BWIP Records Management System"

PMPM 8-105, "Recording Data for Quality Records and Recording Corrections"

PMPM 8-110, "Control of Geotechnical Samples"

PMPM 8-113, "Submittal of Raw Data"

RHO-MA-119, General Plant Rules, "Master Safety Rules," Rockwell Hanford Operations

RHO-MA-221, Accident Prevention Standards, Rockwell Hanford Operations

APS #2, "Pre-Job Safety Planning"

APS #11, "Personal Protective Equipment"

APS #30, "Hearing Conservation and Noise Abatement"

Test and Operations Procedures, Basalt Waste Isolation Project

DT-ES-103, "Shift Report of Operations"

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BOREHOLE GEOLOGIC LOG
Scale: 1" = 10'

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LITHOLOGY

Well No.	Lithology		Time		Permitted & Approved		Time		Date	
	Depth Below Ground Surface	Feet	Start	End	Permitted	Approved	Start	End	Start	End
BD-6400-073.2	0	0								
	10	10								
	20	20								
	30	30								
	40	40								
	50	50								
	60	60								
	70	70								
	80	80								
	90	90								

Figure 1. Sample Borehole Geologic Log, [BD-6400-073.2 (R-4-80)].

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Well No. DC-3X		Date of Completion 6-3-87		Date of Test 6-1-87		Date of Log 6-1-87		Date of Report 6-1-87		Date of Log 6-1-87		Date of Report 6-1-87	
Geology		Geology		Geology		Geology		Geology		Geology		Geology	
Depth Below Ground Surface		Depth Below Ground Surface		Depth Below Ground Surface		Depth Below Ground Surface		Depth Below Ground Surface		Depth Below Ground Surface		Depth Below Ground Surface	
0-34	0-34	0-34	0-34	0-34	0-34	0-34	0-34	0-34	0-34	0-34	0-34	0-34	0-34
34-53	34-53	34-53	34-53	34-53	34-53	34-53	34-53	34-53	34-53	34-53	34-53	34-53	34-53
53-67	53-67	53-67	53-67	53-67	53-67	53-67	53-67	53-67	53-67	53-67	53-67	53-67	53-67
67-76	67-76	67-76	67-76	67-76	67-76	67-76	67-76	67-76	67-76	67-76	67-76	67-76	67-76
76-85	76-85	76-85	76-85	76-85	76-85	76-85	76-85	76-85	76-85	76-85	76-85	76-85	76-85
85-95	85-95	85-95	85-95	85-95	85-95	85-95	85-95	85-95	85-95	85-95	85-95	85-95	85-95
95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100	95-100

Figure 2. Example of Completed Log Form, [BD-6400-073.2 (R-4-80)].

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Graphic Log Symbols

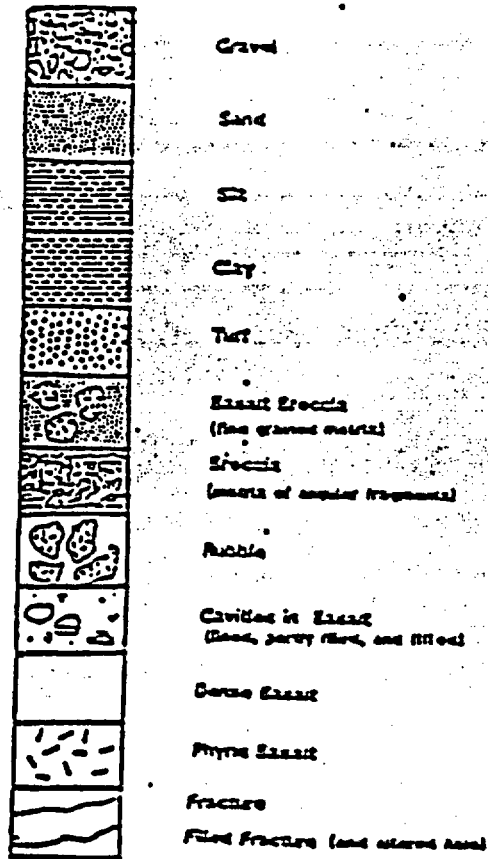


Figure 3. Graphic Log Symbols.

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STANDARD APPROVAL SHEET
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