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Hydrogeology • Mineral Resources Waste Management • Geological Engineering • Mine Hydrology

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Communication No. 153

Mr. Jeff Pohle
Division of Waste Management
Mail Stop 623-SS
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

RE: NTS

Dear Jeff:

A copy of the review of the following document is enclosed.

1. Spengler, R.W., Byers, F.N., Jr., and Warner, J.B., 1981, Stratigraphy and Structure of Volcanic Rocks in Drill Hole USW-G1, Yucca Mountain, Nye County, Nevada. USGS Open-file Report 81-1349, Denver.

Please contact me if you have any questions concerning this review.

Sincerely,

James L Osiensky /s/

James L. Osiensky

JLO:sl

WMGT DOCUMENT REVIEW SHEET

FILE #:

DOCUMENT #: USGS-OFR-81-1349

DOCUMENT: Spengler, R.W., Byers, F.N., Jr., and Warner, J.B., 1981, Stratigraphy and Structure of Volcanic Rocks in Drill Hole USW-G1, Yucca Mountain, Nye County, Nevada. USGS Open-file Report 81-1349, Denver.

REVIEWER: Williams & Associates, Inc., James L Osiensky

DATE REVIEW COMPLETED: October 6, 1987

ABSTRACT OF REVIEW: APPROVED BY: Roy E. Williams

The report under review presents significant stratigraphic and structural data on the volcanic rocks penetrated by drill hole USW-G1. The report contains a significant amount of data pertaining to fractures observed in core from the drill hole. These data are described from a geologic view point; however, the data may be very useful in helping to formulate conceptual models of flow in the unsaturated and saturated zones at Yucca Mountain.

BRIEF SUMMARY OF DOCUMENT:

The report under review describes the stratigraphic and structural characteristics of volcanic rocks penetrated by drill hole USW-G1. The purpose of the report is to present information on the thickness, lateral extent, correlation, and structural characteristics of volcanic rocks penetrated by drill hole USW-G1.

Drill hole USW-G1 was cored continuously to a depth of 6,000 feet between March and August, 1980. According to the report, several factors were used to help select the location for the drill hole. These factors are: 1) The drill hole site was located near an inferred structural zone. 2) The drill hole was located to avoid an east-west-trending magnetic high over Calico Hills which extends westward over most of northern Yucca Mountain. 3) The steep local gravity anomaly over most of northern Yucca Mountain suggests that a greater thickness of tuffs occurs over that area.

According to the report, circulation of drilling fluid was poor to nonexistent during most of the coring operation; drilling fluid losses averaged about 20,500 gallons per day (gpd) throughout the entire length of the hole. According to the report, most of the drilling fluid was lost within the Topopah Spring Member.

The rock units penetrated by the drill hole consist of rhyolitic ash flow tuff, one interval of volcanic breccia of dacitic composition, and subordinate amounts of fine- to coarse-grained volcaniclastic rocks. Table 2 of the report lists the stratigraphic units penetrated by the drill hole. Figure 3 of the report presents the results of an Eastman Whipstock Gyroscopic Survey. According to the gyroscopic survey, the drill hole deviates 475 feet south and 400 feet west of its original surface location. Table 3 of the report presents a detailed lithologic log of the drill hole. According to the lithologic log, the Tiva Canyon Member is the only member of the Paintbrush tuff that is not present in the immediate vicinity of the drill hole. Table 4 of the report presents x-ray analyses of selected samples from drill hole USW-G1. Table 5 of the report presents chemical analyses of selected tuff samples from the Crater Flat tuff and flow breccia in the drill hole.

The structural characteristics of the core were evaluated by the authors of the report. A total of 5,513.7 feet (96.6%) of the core were recovered from the drill hole. According to the report, 21% of the recovered core was wrapped in heavy gauge aluminum foil, labeled, and sealed with bees wax to preserve "in situ" moisture content of the core. The remaining 4,353.9 feet of core were evaluated for structural features which include layering attitudes, evidence of faulting, frequency of occurrence and inclinations of shear fractures and joints, and types of fracture coatings. Approximately 11% of the core was collected using oriented coring techniques. According to the report, "figure 6 shows the location of stratigraphic intervals where meaningful measurements were taken."

Fractures observed in the core were divided into joints and shear fractures for descriptive purposes. According to the report, a total of 61 shear fractures were recognized in the core between depths of 324.8 and 5,468.4 feet. The report suggests that most shears are associated preferentially with particular rock types as well as with conspicuous fault zones. Figure 7 of the report presents structural diagrams that show the inclinations of shear fractures.

A total of 528 joints was identified in the core. The data suggest that, in general, the greatest number of joints occurs in densely welded ash flow tuffs. According to the report, pronounced joint development is confined largely to the Topopah Spring Member and the Tram unit. It should be noted, as mentioned previously, that the Tiva Canyon Member is not present in drill hole USW-G1. Figure 9 of the report shows the inclination of joints, and types of fracture fillings within the core.

According to the report, about 88% of the joint and shear surfaces show evidence of at least a partial coating of secondary minerals. Approximately

40% of the fractures are described as "healed." According to the report, in decreasing order of abundance, the types of fracture coatings observed are silica, manganese and iron oxides, calcite, and clay. Fracture coatings were absent along 12.3% of the examined fractures; most of these fractures occur within the Topopah Spring Member and the flow breccia.

SIGNIFICANCE TO NRC WASTE MANAGEMENT PROGRAM:

The report under review presents significant information with respect to the stratigraphic and structural characteristics of the volcanic rocks in the vicinity of drill hole USW-G1. The information presented in the report may become very valuable with respect to the detailed characterization of Yucca Mountain as a potential repository site. The fracture data presented in the report are described primarily from a geologic view point; however, the information may help to improve conceptual models of flow in the unsaturated zone and the saturated zone.

PROBLEMS, DEFICIENCIES OR LIMITATIONS OF REPORT:

The report under review is typical of most USGS reports. The primary limitation of the report is that the USGS typically does not present all of the data collected for a specific test hole or well within a single report. Usually it is necessary to obtain several different documents to develop a complete picture of the hydrogeology in the vicinity of the test hole. For example, stratigraphic and structural data may be presented in one report while the hydrogeologic testing data and geophysical logs are presented in separate reports. This type of data report may prove to be very useful to the NRC Waste Management Program. Data presented in the report may be very useful in helping to interpret hydrogeologic test data.