D1020

PDR-1
LPDR-
Wm-10 (2)
Wm-11 (2)
Wm-16 (2)

WILLIAMS & ASSOCIATES, INC.

P.O. Box 48, Viola, Idaho 83872 (208) 883-0153 (208) 875-0147

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

May 13, 1987
Contract No. NRC-02-85-008
Fin No. D-1020
Communication No. 127

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. Pawloski, G.A., May 1981, Water Contents of Samples from the Nevada Test Site: Total, Free (Natural State to 105°C) and More Tightly Bonded (105-700°C). Lawrence Livermore National Laboratory, UCRL-53130.

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

Sincerely,

James L Osiensky

James L. Osiensky

JLO:sl

WMGT DOCUMENT REVIEW SHEET

FILE #:

DOCUMENT #: UCRL-53130

DOCUMENT: Pawloski, G.A., May 1981, Water Contents of Samples from the Nevada Test Site: Total, Free (Natural State to 105°C) and More Tightly Bonded (105-700°C). Lawrence Livermore National Laboratory.

REVIEWER: Williams & Associates, Inc., George L. Bloomsburg

DATE REVIEW COMPLETED: May 13, 1987

ABSTRACT OF REVIEW: APPROVED BY: Roy L Williams

The report under review describes the development of improved methods of determining the water content of materials surrounding nuclear test sites. The use of the epithermal neutron logging technique is investigated by measuring the moisture content of samples from a logged borehole in the laboratory. The moisture in the soil was differentiated into free water, more tightly bound water and zeolitic and inner layer water.

The author concludes that the logs can be used to differentiate alluvium from tuff because of differing moisture content and that in some cases various tuff units may be differentiated from each other. A limited amount of the data were available from the Paintbrush unit which occurs in Yucca Mountain; however, none of the data actually were derived from Yucca Mountain.

BRIEF SUMMARY OF DOCUMENT:

The objective of the investigation was to develop a better method for measuring the water content in soils surrounding underground nuclear test sites. At the time the report was written, water content was measured by taking sidewall soil samples promptly at the drill site and measuring water content later. A neutron log may be used for moisture measurement in saturated rocks. The device actually measures hydrogen ion content in the wall of the drill hole. In the case of measuring water in the soil,

extraneous hydrogen may exist that affects the reading of the neutron log. The author discusses the use of an epithermal neutron log to measure total water content which would give better data and would be less expensive than discrete sidewall sampling.

To confirm the correct operation of the epithermal neutron sonde the total water content was measured in laboratory samples from holes in which the epithermal neutron log had been run. The components of water consisted of free water, water driven off by heating to 105°C, more tightly bound water lost in the 105-700°C temperature range, and zeolitic and the inner layer water which is removed by heating to 700°C. The total water content was calculated from the values of free and more tightly bonded water.

A total of 374 NTS samples were tested for more tightly bonded water content. The samples were taken from twelve different drill holes in tuff and alluvial materials. A detailed description is presented of the methods used to determine the more tightly bonded water.

The experimental standard deviation for the more tightly bonded water was determined to be ± 0.0059 of the weight fraction. Calculations for total water content are presented. Results are presented in the form of graphs of water content versus depth in meters. Three curves are shown; one for total water, a second for free water, and a third for more tightly bonded water. The majority of the materials tested were alluvium. A limited amount of data for the Paintbrush tuff exist. These are the only data presented for materials which occur in Yucca Mountain. A correlation between total water content and lithology is presented. It appears to be possible to assign total water content values by lithologic units. Differentiation of alluvium from tuff by water content is possible and in some cases the various tuffs may be differentiated. After the epithermal neutron sonde is calibrated it may be possible to differentiate lithologic units by the water content values determined by methods presented in this report.

SIGNIFICANCE TO NRC WASTE MANAGEMENT PROGRAM:

This paper does not appear to be of significance to the High-Level Waste Repository Program. Few data are for materials which occur in Yucca Mountain; no data are derived from the region of the repository. Some of the methodology developed for determining water content possibly could be of significance in the repository program.

PROBLEMS, DEFICIENCIES OR LIMITATIONS OF REPORT:

The weakest portion of the report is that research did not include data for Yucca Mountain. However, at the time the report was written, Yucca Mountain was not of great interest to the High Level Waste Repository Program.