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OFFICE MEMORANDUM

TO :Dan W. Wilson, H-12 Group Leader

DATE: November 1, 1978

FROM :Willy Abeele, H-12

SUBJECT :MONTHLY REPORT

SYMBOL :H12-78-358

MAIL STOP: 490

TA-5D

1. Review of the literature concerning studies of the effect of soil density on the estimation of moisture content using the neutron probe, convinced me that a serious error had been introduced by disregarding this factor. Waters & Moss (Nature, 1966), Holmes (Soil Science 1966) Lal (Soil Science 1974) and Babalola (Soil Science 1977) indicate that a lower bulk density than forseen may lead one to believe in a lower moisture content than the actual one. Several French scientist showed a concern for the composite effects of bulk density, chemical composition and texture on soil moisture content estimation at a FAO/IAEA Symposium held in Istanbul in 1967.

Troxler, the manufacturer of the neutron moisture probe which was recently calibrated for various hole linings and diameters, did not indicate how these factors were going to influence our readings. Consequently, the readings taken with the 51 mm aluminum pipe were calibrated against Troxler's moisture content estimates which Troxler claimed to be valid at that hole diameter and lining, disregarding the effect of any other independent variable. I considered my results as "off" due to heterogeneity of soil moisture distribution. I am now convinced that the different results are due to a difference in bulk density, texture, and chemical composition between the soil used by Troxler and our own Bandelier Tuff. This disparity can be verified any time and was again confirmed in tests performed during the month of October and during the tritium aeration experiments concluded not long ago where neutron probe moisture readings differed consistently from the ones obtained by desiccation.

Consequently, the revised Moisture Ratio by Volume estimates are as following:

a) When using a 0.060 m PVC tube (for PI-holes): MRV = -0.0075 + 0.5129 C.R.

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b) When using a 0.076 m uncased hole (for S-50 and Area C)
MRV = 0.0096 + 0.3511 C.R.

c) When using a 0.102 m uncased hole (for P7-holes)
MRV = 0.0072 + 0.3965 C.R.

2. Since no significant difference was observed at the 0.01 level of confidence after performing an Analysis of Variance and since it is not without precedents (Babalola, Soil Science 1977), I suggest we cut down the count time with the neutron probe from one minute to one half-minute.

3. Coring in Area C was momentarily discontinued due to extremely high contamination that occured at one of the selected spots. Rewriting of the SOP and adoption of additional safely measures are now well under way.

WA:tj

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