(5) Justus, NMSS

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MEMORANDUM FOR: Andrew Murphy, Section Leader
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FROM: Thomas Schmitt, Geologist
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SUBJECT: TRIP REPORT: DOE/NRC WORKSHOP OF GEOLOGY OF THE NEVADA TEST SITE

On October 3-8, 1983, I attended the pre-licensing review of the Nevada Test site. This trip report deals with my perception of the issues that have research implications; that is, where confirmatory research needs to be conducted to develop a decision methodology so that a licensing decision can be made.

Four issues in particular were raised. The seismic activity of the site; the geologic stability of the site (likelihood of faulting); the possibility of volcanism at the site; and the state of stress at the site.

Seismicity, Faulting and Volcanicity

The site is tectonicly active; there is seismicity at the site, recent faulting at the site, and volcanic activity as young as 250,000 yrs. It is important to establish the significance of this activity to the performance of the repository. The proposed repository horizon is in the unsaturated zone and the performance assessment will probably heavily rely on that. The site is presently faulted and future faulting is unlikely to be significantly different from the past faulting. Thus it is unlikely that future faulting would change the hydrology of the site. The seismicity of the area is well known and thus probability of ground shaking can be determined. The volcanic processes at the site are well known and the nature of future volcanic activity at the site is predictable. It is likely that a repository can be designed for the site that will not be adversely affected by the predicted faulting, seismicity, or the volcanism.

The uncertainty issue is how well can the future faulting, seismicity and volcanism be estimated or conservatively bounded.

Stress Measurements

Stress measures have been conducted at Yucca Mountain. The increase in

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stress with depth shows that shear stress increases linearly with depth $\tau \approx .75\,\sigma_n$. Laboratory measurements indicate that the coefficient of friction is about .85. If that laboratory measurement is correct then the trend of stress with depth is away from the failure criteria.

There are two issues: the coefficient of friction; and the nature of the stress increase. μ .85 is a high coefficient of friction. Laboratory measurement commonly overestimate the coefficient of friction. If the value is overestimated then it is possible that the trend of the stress with depth is towards the failure criteria. Also, stress measurements elsewhere on the test site indicate a different trend with depth. Attached is a diagram derived from data from Haimson's experiments at Ranier Mesa. The increase of shear stress with depth is somewhat less than $\tau = .5\,\sigma_n$. Why there are different trends in stress at two sites so closely spaced is not clear.

There are several interpretations, however, two issues are of concern; (1) the tunneling experience and design experience at other locations on the test site may not be transferable because of the different stress conditions; and (2) the Yucca Mountain stress field suggests that the mountain may be continously near mechanical failure of the slip planes.

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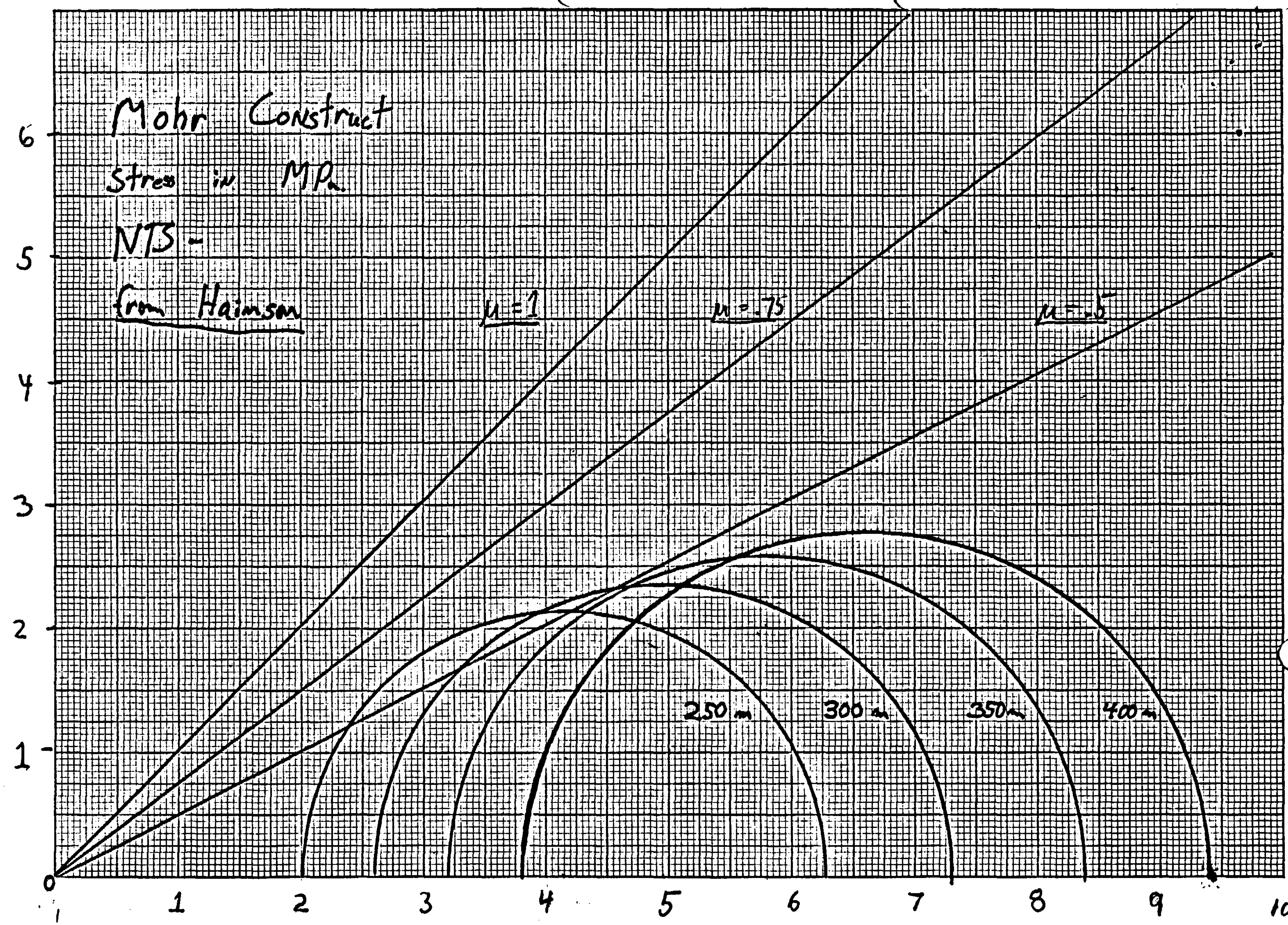

Mohr Construct
Stress in MPa
NTS -
from Haimson
μ = 1
μ = .75
μ = .5
250 m
300 m
350 m
400 m
0
1
2
3
4
5
6
7
8
9
10