DRAFT

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NOTE FOR: Phil Justus

FROM: Keith McConnell

SUBJECT: ADDITIONAL EVIDENCE FOR POSSIBLE FAULTING IN THE VICINITY OF THE EXPLORATORY SHAFTS

In reviewing several publications (of early 80's vintage), I have developed what I believe is additional evidence to support possible faulting in the vicinity of the Exploratory Shafts. Generally, my analysis compares and contrasts relationships observed in boreholes G-4 and UE25a-6. These boreholes define an west-east trending section running just south of the sites of the proposed exploratory shafts in Coyote Wash. To the best of my knowledge, the DOE in its investigation of shaft location concerns has not carried out a similar comparison between these two boreholes, a task that would seem to be routine in a thorough examination of available data.

The analysis of the data in the two boreholes suggests that a conceptual model of faulting is possible in which the current locations of the ES are in or adjacent to an extension of the zone of imbricate faulting that has been referred to in the SCP as bordering the repository on the east. The validity of this model is open to debate, however, there is enough data available supporting the model to warrant consideration. In any event, DOE's claim in the Technical Assessment Review documentation that only the resistivity survey of Smith and Ross (1982) supports the presence of fault in the vicinity of the ES is not totally accurate.

Attachment 1 shows the relationship between borehole G-4, the exploratory shaft locations, and borehole UE25a-6. The boreholes are approximately 1400 ft. apart and borehole UE25a-6 is approximately 1000 ft east of the exploratory shaft locations. Both boreholes appear to be within the CPDB. A comparison of some pertinent data derived from the two boreholes is listed below.

	G-4	UE25a-6
Thickness of Alluvium	30'	20'
Avg. Strike	N 15 W	N 23 E
Avg. Dip	10 NE	08 SE
Elevation of base of Tiva Canyon	4028.6'	3907'
Elevation of top of Topopah Spring	3938.6'	3824'

Assuming a uniform dip of 9 degrees (i.e., average of dips in boreholes) to the northeast, the base of the Tiva Canyon at UE25a-6 should be approximately 221 feet below the level indicated in G-4 (i.e., 3806.9'). However, the base of

the Tiva Canyon is at an elevation of 3907' in UE25a-6 (Spengler and Rosenbaum, 1980), a difference of 100'.

Also of interest is that Daniels and others (1981) report that if the degree of welding is approximately the same for UE drillholes, then near-surface fracture zones are likely to occur near UE25a-6. Core recovery was poor in UE25a-6, the worst of all of the UE boreholes described by Spengler and Rosenbaum (1980). The poor core recovery is also suggestive of fracturing.

Several questions are raised by the comparison of boreholes G-4 and UE25a-6.

1) Why is the thickness of the alluvium in UE25a-6 (which is east of and presumably in a deeper part of Coyote Wash than G-4) equal to or less than that in G-4?

2) Why is the orientation of bedding so distinctly different between boreholes G-4 and UE25a-6?

3) Why is the elevation of the base of the Tiva Canyon 100' higher than would be suggested by a uniform dip of 9 degrees to the east?

4) What is the significance of the statement by Daniels and others (1981) that near-surface fracture zones may be present near UE25a-6 when viewed in the context of the poor core recovery and the areas of intense fracturing near the location of the exploratory shafts?

Each of these questions has more than one possible answer, some of which would not involve faulting. However, one possible model that does provide answers to all of these questions and support the "resistivity fault" of the Smith and others (1982) report would consider the possible presence of a major fault or series of minor faults (i.e., imbricates) between boreholes G-4 and UE25a-6 and including the area of the ES. Total vertical offset along this fault or series of faults would be on the order of 100'. This model is given added credence when viewed in the context of the statement made in the Bertram (1984) report that the western boundary of the zone of faults on the east side of the exploration block is not well defined and that a set-back distance of 2000' was used to place the shaft outside of that zone of faulting (Bertram, 1984, p. 54). If the zone of faulting mentioned in Bertram continues to the west through the area containing UE25a-6 and into the area of the shaft locations, then the criteria for set-back distance from the imbricate fault zone used in the Bertram report for shaft locations appears to be unsupported.

Perhaps the most significant question regarding the data available from UE25a-6 is why a simple cross-section between boreholes G-4 and UE25a-6 has not been presented by DOE. These two boreholes are the closest boreholes to the ES locations. No documentation has been presented to suggest that data related UE25a-6 was considered in the present location of the shafts or to indicate that this information is under consideration in the Technical Assessment Review.

References Cited

Bertram, S., 1984, NNWSI Exploratory shaft site and construction method recommendation report: Sandia National Laboratory, SAND 84-1003, 100 p.

Daniels, J.J., Scott, J.H., and Hagstrum, J.T., Interpretation of geophysical well-log measurements in drill holes UE25a-4, -5, -6, and -7, Yucca Mountain, Nevada Test Site: U.S. Geological Survey Open-File Report 81-389.

Smith, C. and Ross, H.P., 1982, Interpretation of resistivity and induced polarization profiles with severe topographic effects, Yucca Mountain area, Nevada Test Site, Nevada: U.S. Geological Survey Open-File Report 82-182, 21 p.

Spengler, R.W., and Rosenbaum, J.G., 1980, Preliminary interpretations of geologic results obtained from boreholes UE25a-4, -5, -6, and -7, Yucca Mountain, Nevada Test Site: U.S. Geological Survey Open-File Report 80-929, 33 p.

Spengler, R.W., and Chornack, M.P., 1984, Stratigraphic and structural characteristics of volcanic rocks in core hole USW G-4, Yucca Mountain, Nye County, Nevada: U.S. Geological Survey Open-File Report 84-789, 77 p.

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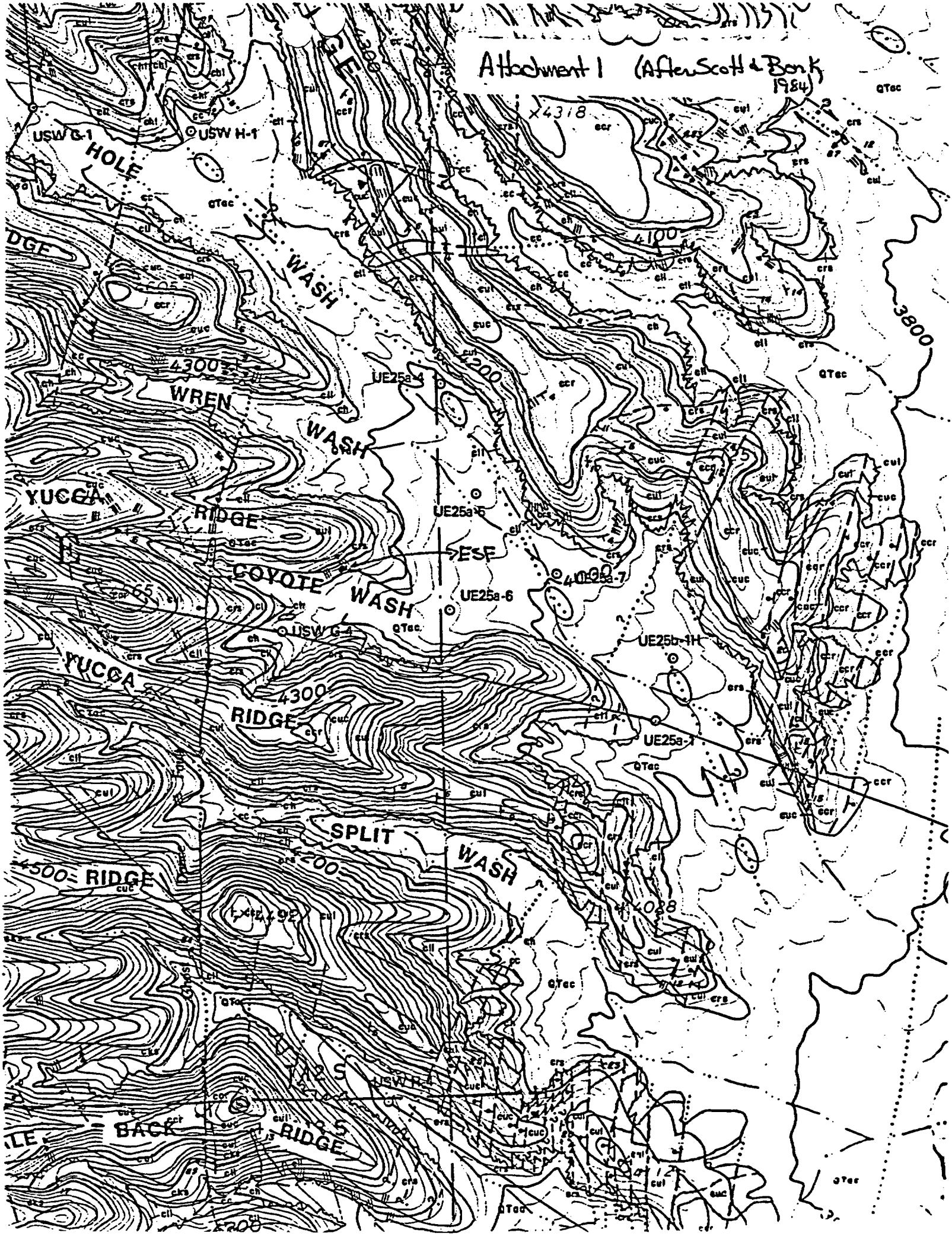
Attachment 1 (After Scott & Bonk 1984)
USW G-1
USW H-1
HOLE
WASH
WREN
WASH
YUCCA
RIDGE
COYOTE
WASH
USW G-4
YUCCA
RIDGE
SPLIT
WASH
RIDGE
BACK
RIDGE
UE25a-4
UE25a-5
UE25a-6
UE25a-7
UE25b-1H
UE25a-1
USW H-4
ESE
4300
4200
4100
4000
3800
4318
4028
QTac