



United States Department of the Interior

FILED
MAR 22 1993
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GEOLOGICAL SURVEY
Yucca Mountain Project
101 Convention Center Dr.
Suite 860 MS 509
Las Vegas, NV 89109
FAX 702 794 7090

28 March 1993

Mr. Robert Sandifer
M&O MGDS Development Manager
101 Convention Center Dr.
Suite 527 MS 423
Las Vegas, NV 89109

1-341056

Dear Mr. Sandifer,

The U. S. Geological Survey has been requested to participate in an ESF design task to determine the elevation of the contact between thermal-mechanical units TSw1-TSw2 at the intersection of the curve at the end of the north ramp and the TS main drift (EC 1). This letter summarizes two methods of determining the elevation of this contact at EC-1 that were used by members in our Rock Characteristics Section. This information was originally included in a letter from David Buesch (USGS) to Rick Nolting (M&O MK) on March 22, 1993. The first method is a three point solution using information from drill holes and predicts an elevation of 3368 feet for the TSw1-TSw2 contact at EC-1. The second method is a preliminary projection from the three-dimensional lithostratigraphic model under development at the USGS using the LYNX software and predicts an elevation of 3404 feet. Both methods have caveats that must be kept in mind, so please read, consider, and remember the following discussion as you add these results to the other methods that you have evoked.

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Some of the geology near Drill Hole Wash in the vicinity of EC-1 is complex, whereas some areas are relatively simple (Scott and Bonk, 1984). The predicted depth of the TSw1-TSw2 contact at EC-1 will depend on what drill holes are used. One fault is mapped along Drill Hole Wash that has at least some component of strike slip motion on it (Scott and Bonk, 1984), but more than one fault can be in this wash, we just do not know. Several drill holes, including UE25a #1, UE25a #7, and UE25b #1, that might be used in modeling the TSw1-TSw2 contact are in Drill Hole Wash, therefore the effect of faulting can not be ruled out. Drill hole UE25a #1 is east of two north trending faults that have more than 20 feet of down-to-the-west displacement. Simple three point or surface modeling solutions using these drill holes must be viewed with caution.

UE25 #1
UE25 #7
UE25 #1

A three point solution can be constructed to project the TSw1-TSw2 contact to EC-1 on the basis that the area between drill holes G-4, UE25a-6, and NRG-6, has no mapped faults (Scott and Bonk, 1984), and assuming EC-1 is southwest of any fault in Drill Hole Wash. The contact of TSw1 and TSw2 is the lithostratigraphic contact between the upper lithophysal (Tul) and middle nonlithophysal (Tmn) zones of the Topopah Spring Member of the Paintbrush Tuff. Drill hole UE25a-6 intersects the top of the Tul, but not the base of the unit. To determine the elevation at the base of the Tul, my three point solution used the top of the Tul, projected this horizon to EC-1, and subtracted the thickness of the Tul determined in NRG-6. The top of the Tul has a strike and dip of N13W 4NE. Construction was at a scale of 1:6000. The result of this exercise is the TSw1-TSw2 contact at EC-1 is expected at 3368 feet (Table 1).

G-4
UE25 #6
NRG-6

The LYNX three dimensional (3-D) lithostratigraphic model is in the process of construction with a milestone of the end of April, therefore it must be emphasized that the estimated depth of the TSw1-TSw2 contact is based on preliminary information that needs to be internally checked prior to being used in any quality affecting action. We provide the projection for discussion and comparative purposes only. In the simplest of terms, the LYNX model is a sophisticated 3-D drawing created in commercially available program. One of the great strengths of the program is the ability to visibly test for 3-D geometry continuity of the model. Initial drawing of the zones in the Topopah Spring Member near EC-1 is about complete, but has not been rigorously checked for continuity. Drill hole data from the 1991 to 1993 drilling period has not been included in the 3-D model, and will be used for checking the model. The projected elevation of the TSw1-TSw2 contact at EC-1 is 3404 feet (Table 1). To get an appreciation for the validity of this value, consider the comparison of the actual versus predicted elevation of this contact in NRG-6. At NRG-6 the observed elevation of TSw1-TSw2 contact is 3379 feet and the predicted elevation is 3427 feet. This difference of 48 feet is only 6.7 percent of the drill hole depth at this contact. Knowing that the predicted elevation is 48 feet higher than the observed elevation in NRG-6, one option in estimating the elevation of this contact at EC-1 is to subtract 48 feet from the predicted elevation resulting in an adjusted contact at 3356 feet.

Table 1. Estimated elevations of the TSw1-TSw2 contact at EC-1.

Method	EC-1 predicted depth in feet	EC-1 adjusted depth in feet	NRG-6 predicted depth in feet	NRG-6 observed depth in feet
three point	3368			
LYNX 3-D	3404	3356	3427	3379

I hope you find these estimates of use, but remember that especially the information from the LYNX model is preliminary and will probably change as revision to the model continues. If you have any questions please call David Buesch at 702 794-7195.

Larry A. Hayes

Larry Hayes
 Technical Project Officer
 U. S. Geological Survey

- cc: R. Dyer, YMPO
- D. Williams, YMPO
- W. Simecka, YMPO
- K. Bhattacharyya, M&O MK
- R. Nolting, M&O MK
- J. Stuckless, USGS/Denver
- R. Spangler, USGS/Denver
- D. Buesch, USGS/LV