United States Department of the Interior

BUREAU OF MINES

P. O. BOX 2' 36
BUILDING 20, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

WM DOCKET CONTROL CENTER

'83 DEC 2

Denver Research Center
Ground Control Division

December 6, 1983

Memorandum

To: Harry R. Nicholls, Assistant Director--Mining Research

Through: Richard H. Oitto, Research Director, Denver Research Center

From: E. E. Hollop, Research Supervisor, Ground Control Division, Denver Research Center

Subject: Review of BWIP (Basalt Waste Isolation Project) In-situ Testing

As per your memorandum, August 4, 1982, we are forwarding a review conducted for NRC (Nuclear Regulatory Commission) under agreement NRC-02-08-075. The document review was entitled "Rockwell-Hanford Basalt Waste Isolation Project" Volumes I and II, Exploratory Shaft Test Plan (11/9/83).

The format submitted was requested by NRC. If your review approves this document, it may be forwarded to Mr. John Greeves, Chief Engineering Branch, Nuclear Regulatory Commission, Willste Building, 6th floor, Silver Springs, Maryland 20555.

Edward E. Hollop

Enclosure

B-6934 10,11,16

B, N, S

J GREEVES
D TIKTINSKY
IS

8411080175 831206
PDR WMRES EUSDOIMI
B-6934 PDR

November 25, 1983

BUREAU OF MINES

Denver Research Center

Ground Control Division

Review questions - Rockwell-Hanford Basalt Waste Isolation Project document SD-BWI-TP-007, Vols. I and II, "Exploratory Shaft Test Plan", Rev. A-0, dated 11/9/83.

BUREAU OF MINES - DENVER RESEARCH CENTER

Ground Control Division

General Review Questions - Rockwell-Hanford Basalt Waste Isolation Project document SD-BWI-TP-007, Vols. I and II, "Exploratory Shaft Test Plan", Rev. A-0, dated 11/9/83.

1. (Vol. I, pgs. 5-49,50; Vol II, pgs. 5-1)

   What decision process was employed to select blind boring for the exploratory shaft?

BUREAU OF MINES - DENVER RESEARCH CENTER

Ground Control Division

General Review Questions - Rockwell-Hanford Basalt Waste Isolation Project document SD-BWI-TP-007, Vols. I and II, "Exploratory Shaft Test Plan", Rev. A-0, dated 11/9/83.

(Vol. I, pgs. 5-50 through 52; Vol. II, pgs. 5-22 through 24)

2. Has a method been selected to conduct sealing of the shaft liner?

BUREAU OF MINES - DENVER RESEARCH CENTER

Ground Control Division

General Review Questions - Rockwell-Hanford Basalt Waste Isolation Project document SD-BWI-TP-007, Vols. I and II, "Exploratory Shaft Test Plan", Rev. A-0, dated 11/9/83.

(Vol. II, pgs. 5-24 through 30)

3. What method is to be used for sealing boreholes drilled from surface and underground?

BUREAU OF MINES - DENVER RESEARCH CENTER

Ground Control Division

General Review Questions - Rockwell-Hanford Basalt Waste Isolation Project document SD-BWI-TP-007, Vols. I and II, "Exploratory Shaft Test Plan", Rev. A-0, dated 11/9/83.

(Vol. II, pgs. 4-56 through 64)

4. Evaluation of support systems should be conducted under heating conditions. If resin is selected for support, high temperature tests to evaluate the integrity of the resin should be conducted.

BUREAU OF MINES - DENVER RESEARCH CENTER

Ground Control Division

General Review Questions - Rockwell-Hanford Basalt Waste Isolation Project document SD-BWI-TP-007, Vols. I and II, "Exploratory Shaft Test Plan", Rev. A-0, dated 11/9/83.

(Vol. II, pgs. 4-56 through 64)

5. Visual observations (borescopes) of sample holes may be advisable for evaluating support length and placement.

BUREAU OF MINES - DENVER RESEARCH CENTER

Ground Control Division

General Review Questions - Rockwell-Hanford Basalt Waste Isolation Project document SD-BWI-TP-007, Vols. I and II, "Exploratory Shaft Test Plan", Rev. A-0, dated 11/9/83.

(Presence of columns described Vol. II, A-8 through 13; a, b, and c, Vol. II. pgs. A49-60)

6. With respect to the vertically-jointed basalt columns, the following questions should be answered:

   a). Have column-buckling calculations been done to estimate the ability of the columns to resist buckling?

   b). Will deformations due to mining-induced horizontal stresses be considered in the column strength calculations?

   c) Have *in situ* column buckling tests been considered?

BUREAU OF MINES - DENVER RESEARCH CENTER

Ground Control Division

General Review Questions - Rockwell-Hanford Basalt Waste Isolation Project document SD-BWI-TP-007, Vols. I and II, "Exploratory Shaft Test Plan", Rev. A-0, dated 11/9/83.

(Degree of disking shown in diagrams in Vol. II, pgs. A-9 through 12; occurrence mentioned Vol. II, pg. A-60)

7. Experience indicates that core disking in some exploratory boreholes is indicative of high horizontal stress. High horizontal stress raises the possibility of rock bursts. Does the plan incorporate proper precautions to detect burst prone conditions until experience shows that such conditions do not exist?

BUREAU OF MINES - DENVER RESEARCH CENTER

Ground Control Division

General Review Questions - Rockwell-Hanford Basalt Waste Isolation Project document SD-BWI-TP-007, Vols. I and II, "Exploratory Shaft Test Plan", Rev. A-0, dated 11/9/83.

(Vol. II, pgs. A-50)

8. Will the loss of rock strength with increasing temperature be measured?

BUREAU OF MINES - DENVER RESEARCH CENTER

Ground Control Division

General Review Questions - Rockwell-Hanford Basalt Waste Isolation Project document SD-BWI-TP-007, Vols. I and II, "Exploratory Shaft Test Plan", Rev. A-0, dated 11/9/83.

9. Why are some pages labeled SD-BWI-TP-007 while others are SD-BWI-TL-007?

BUREAU OF MINES - DENVER RESEARCH CENTER

Ground Control Division

Review questions - Rockwell-Hanford Basalt Waste Isolation Project document SD-BWI-TP-007, Vols. I and II, "Exploratory Shaft Test Plan", Rev. A-0, dated 11/9/83.

Specific Questions on Vol. II of the Draft:

1. p. 4-19, Table 4-1, - The method for estimating "Rock Mass Deformability" described at the top of pp. 4-18, in which numerical modeling methods are used to back calculate the "RMD" from the mine by test results, is not included in Table 4-1. This method may be the preferred method for determining the "RMD" in the undisturbed zone away from the excavation. Is or is not this method in the test plan?

2. pp. 4-18, sec. 4.1.3.5.3.1, Block Tests - How far from the excavation would these tests be performed and would that distance be sufficient to measure the ndisturbed "RMD"? Considering the variability of the basalt structure, will only 2 tests be adequate for modeling purposes? If the block tests are to follow ES-II, will the resulting deformability data be available in time for the numerical modeling studies?

3. pp. 4-23, sec. 4.1.3.6.3.2, Laboratory Testing of Jointed Samples - Undisturbed samples of joints are to be tested for shear strength using 10-inch diameter cores. How would the cores be obtained so as to not disturb the joints? Have you considered using Rocha's integral sampling technique for obtaining undisturbed samples of joints?

4. pp. 4-21, and 4-22, sec. 4.1.3.6, Rock Mass Properties - Strength - This section says that no large scale strength tests are planned, the largest being on 10-in diameter cores. Because rock strength is often size dependent, particularly where joints are involved, the strength of the rock mass must be estimated from the strength of these 10-inch cores. This involves selecting and using a scaling law or relationship. How would this be done?

5. pp. 4-14, sec. 4.1.3.4, In Situ Stress Determination - Have you considered performing core disking, drilling tests and laboratory tests to calibrate the onset and spacing of the disks with respect to stress?

6. pp. 4-228, sec. 4.3.14. 4, Test Design - Has consideration been given to performing a hydraulic fracturing mine-back experiment? The fracturing could be done ahead of an advancing drift using a flourescent dye to determine if the direction of fracture changes away from the fracturing hole and how geologic structure affects the direction.

7. pp. 4-220, Figure 4-28 - This figure shows the up hole to be 50 feet deep. Overcoring at this depth is normally difficult to next to impossible. It is recommended that a vertical down hole be drilled, instead of an up hole, to a depth of one width of the mine opening in order to be out of the influence of this drift. Horizontal overcoring measurements should also extend to 1 to 1 1/2 times the height of the opening.

8. pp. 4-223, sec. 4.3.13.5, Equipment and Instrumentation - The reverse guage case was not designed to reduce vibration during drilling nor can it do so. The reverse gauge case is used when 8" lengths of 6-inch diameter core or longer are not obtainable. The reverse gauge core is designed to allow for complete relief data in 5" to 6" lengths of the 6-inch diameter core. To determine correct in situ stresses from this relief data, the correction factor as shown on page 16 of the U.S. Bureau of Mines Report of Investigtion "Improvements in the Three-Component Borehole Deformation Gage and Overcoring Techniques", must be used. It is recommended that 3 strain indicators or the equivalent be used during overcoring so that the deformations can be observed and any irregularities such as fracture separations or pieces of core breaking off and hitting the cable can be noted, readings taken, and corrections made to the relief data.