ENGINEERS INTERNATIONAL, INC.

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Ref. No. 1085-001-012

High Level Waste Technical Development Branch
Division of Waste Management
U. S. Nuclear Regulatory Commission
7915 Eastern Avenue
Mail Stop 623-SS
Silver Spring, MD 20910

Attention: Mr. Trueman Seamans, Mail Stop 623-SS, Project Officer

Dear Mr. Seamans:

Enclosed is one (1) copy of the trip report for October 4-7, 1982, as required by the contract. This report summarizes the BWIP design workshop held in Richland, Washington.

Sincerely,

ENGINEERS INTERNATIONAL, INC.

V. Rajaram
Project Manager

VR/ja

Enclosure

cc F. S. Kendorski

# MEETING REPORT

## Contract No. NRC-02-82-030
## Technical Assistance for Design Reviews

DATE: October 4-7, 1982

PLACE: DOE/RHO Offices
Richland, Washington

PURPOSE: Attend Basalt Waste Isolation Project (BWIP) Design Workshop, and provide technical assistance as required.

### Participants

Engineers International, Inc. (EI)
V. Rajaram
F. S. Kendorski

Nuclear Regulatory Commission (NRC)
J. Greeves
R. Wright
M. Nataraja
L. Chase

Golder Associates, Inc. (GAI)
D. Pentz
J. Daemen (consultant)

U. S. Bureau of Mines
E. Corp.

DOE/RHO Technical and Administrative Personnel

### Meeting Summary

The meeting was held to obtain information from DOE/RHO technical personnel on the status of the design effort at the Basalt Waste Isolation Project (BWIP). Four major agenda items discussed were:

- Conceptual design
- In-situ stress/strength.
- Opening design methodology
- Exploratory shaft/in-situ test plans

Comments and observations made by EI on these four items are discussed below.

### Comments and observations made by EI

A. Conceptual Design

The conceptual design is preliminary and vague, and has not included details completed separately in the past that could refine the concepts.

1. The design approach does not consider fully, the effects of geologic discontinuities on rock mass deformation and opening stability.

2. Potential water inflows into the repository are insufficiently considered in the design.

3. The retrieval requirement is not considered fully.

4. The design assumptions do not seem to be based on all aspects of licensing requirements, especially in the area of performance assessment.

5. The design criteria do not provide for the current uncertainty of data at the RRL site.

B. In-situ Stress/Strength

1. The in-situ stress data appear to be reproducible, and methods to determine the variability of in-situ stress at the RRL site seem to be well conceived.

2. The Mid Sentinel Bluff is a horizon located above the Umtanum which is presently being considered by the BWIP. Attempts to characterize the strength of the Mid Sentinel Bluff and the manner in which this data will be used in repository design have to be clearly outlined.

3. Data on intact rock strength are variable, and hence, the rationale for the selection of the strength value used in design needs to be provided. Reduction of intact rock strength resulting from geologic discontinuities has not been considered.

C. Opening Design Methodology

1. The opening design methodology used to date is based on elastic analyses whereas the deformation of a jointed rock mass is inelastic. Hence, improvements in analytical approaches are required to consider the behavior of jointed rock in a high-horizontal stress field. Prior non-elastic analyses are known to exist, but have not been incorporated into the design.

2. Acceptable failure needs to be defined, and analysis of several modes of failure should be conducted to determine the stability of openings.

3. Sensitivity analysis should be conducted to determine the sensitivity of the various input parameters, viz. in-situ stress, rock mass properties, and failure criteria, on the stability of openings.

4. The rationale used for support design, and the performance of the support over a 50-year period, need further definition.

D. Exploratory Shaft/In-situ Test Plans

It is not clear if the exploratory shaft will, at a later date, become an integral part of the repository. If it will be included as part of a repository, the sealing program should be evaluated from the standpoint of 10CFR60 requirements.

1. The exploratory shaft (ES) design and construction appears to be handled by personnel who have extensive experience in blind boring of shafts.

2. Sensitivity studies of the sealing program are required to determine the effect of varying layers of geologic material, with their unique geologic and hydrologic characteristics, on the sealing requirements in the exploratory shaft.

3. Quality assurance during drilling and grouting is extremely important to ensure the effectiveness of the shaft sealing program. Strict procedures for monitoring and implementing the QA plan should be incorporated.

4. The applicability and long-term effectiveness of chemical seals should be studied before they are used in the ES.

5. Inspection of the portholes with a TV camera and geophysical methods (if applicable) should be planned. In addition, a cement bond log should be run to check the effectiveness of the seal. If any portion of the the seal is found to be defective, procedures for remedial action should be incorporated in the design.

6. The liner stress, especially in the deeper portions of the shaft, should be carefully considered and adequately designed for.

7. Geologic predictability and performance assessment should be the two major objectives in planning and conducting the in-situ tests.

8. A test drift, about 20 feet wide by 10 feet high, should be incorporated in ES-II. This room should be monitored to determine rock mass behavior and support requirements. Drilling of waste emplacement holes should also be an

activity in ES-II to determine the difficulties in drilling and maintaining the stability of horizontal/vertical holes.

Cost Breakout

Expenses for the trip are detailed in the attached sheets.