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Distribution:
Buckley
(Return to WM, 623-SS)

Mr. John Buckley
U.S. Nuclear Regulatory Commission
7915 Eastern Avenue
Silver Spring, MD 20910

Subject: Major Comments on the Hanford Site EA

Dear Mr. Buckley:

Enclosed are the major comments on the Hanford Site EA. Please call me if you have any questions.

Sincerely,

ENGINEERS INTERNATIONAL, INC.

Amitabha Mukherjee

Amitabha Mukherjee
Mining Engineer

AM/ja

Enclosure

cc: David Tiktinsky

MC
1085L

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Major Comments on the Hanford Site EA

1. Preclosure Technical Guideline No. 960.5-2-9, (c)(5), Potentially adverse conditions.

The EA states that "while some water inflow into excavated openings is anticipated, the volumetric flow rate is expected to be minimal based on current knowledge". This statement does not consider the following possibilities:

- sudden thickening of the flowtops and intersection of these flowtops or vesicular zones in repository drifts, especially in the vicinity of waste emplacement panels

- shaft liner failure

Based on the probabilities of these events occurring during the preclosure period, ranges of water inflow should be computed, and contingency measures outlined to deal with the expected inflows.

Case histories of water inflow under the temperature and pressure conditions that will be encountered in the repository should be discussed to demonstrate that these inflows can be handled with available technology.

2. Preclosure Technical Guidelines Nos. 960.5-2-9 (b)(1) and 960.5-2-9 (c)(1). Rock characteristics, Favorable condition 1, and Potentially adverse condition 1.

The two technical guidelines outline the requirement of the host rock to be sufficiently thick and laterally extensive to allow for sufficient flexibility in selecting the depth, configuration, and location of the underground facility. The EA states that the requirements of these two guidelines have been met because, "The Cohassett flow provides more than twice the minimum thickness (21 meters) necessary to construct the repository" (Page 6-157, paragraph 1) and "The option to select from three other candidate horizons.... may provide further flexibility at depth...." (Page 6-153, paragraph 2).

The justification provided is based upon the minimum thickness of host rock required to accommodate the repository, namely 21 meters. Statistical analysis of Cohassett flow thickness data show that the thickness of the Cohassett flow dense interior below the flowtop (DIBFT) is 37.34 m, and that below the vesicular zone (DIBVZ) is 20.47 m. at a 97.5% confidence level (Page 6-159, Table 6-13). Since the repository should not be located in the vesicular zone [rock strength values of the vesicular zone is 35% to 65% of the dense interior (Long and WCC, 1984)], the thickness of the dense interior below the vesicular zone (DIBVZ) should be considered in the analysis.

This is especially true in the Cohassett flow because the vesicular zone lies 30±5m below the flowtop. Therefore, the Cohassett flow does not provide twice the minimum thickness, and hence does not provide the extent of vertical flexibility indicated in the EA.

Further flexibility is not provided for by the presence of the other candidate flows because the total thickness below the vesicular zone in the other three flows are smaller than the minimum thickness criterion (21 m).

If the repository is located in the Cohassett flow, contingency plans must be developed in case the vesicular zone is intersected during excavation. These zones may have to be abandoned and sealed so that they do not become preferential pathways for ground water and radionuclides.

3. Preclosure Technical Guideline No. 960.5-2-9 (c)(4), Rock characteristics, Potentially adverse condition 4.

It is acknowlegded that this potentially adverse condition may be present at the reference repository location, however the statement that "the potential for safety hazards on difficulty in retrieval can be handled by using standard practices" is not true. Uncertainties exist in the following areas:

- thermal-induced fracturing, and hydration and dehydration of mineral components in the fractures is possible around waste emplacement boreholes. This can cause water inflow which will turn to steam in the borehole

- canister integrity could be jeopardized by rock spalling and impinging on the canisters

- retrieval operations would have to be performed after room cooling, stabilizing the ground (if necessary), and in a generally hostile emvironment.

4. Preclosure Technical Guideline No. 960.5-2-9 (b)(2), Rock characteristics, Favorable condition 2.

This favorable condition requires that the host rock should require minimum or no artificial support. Due to the uncertainties associated with the development of thermal-induced stresses, it is acknowledged that this favorable condition is not present at the repository horizon.

The discussion, however, maintains that thermally induced stresses will not require any major redesign of the support system, and is based on analyses presented in Barton, 1984. The state of stress created due to the heated waste containers have been assumed (Barton, 1984), and therefore the statement, "When the effect of thermal-induced stresses were included in the Barton analysis,.... the support requirements did not increase significantly," (Page 6-169, paragraph 2), is not justified. The long-term effects of heated conditions, on the support system itself (grouted dowels and shotcrete) have also not been considered.

The interaction between the rockmass and thermal-induced stresses should be discussed in more detail and all associated uncertainties should be fully outlined.

5. Postclosure Technical Guideline No. 960.4-2-3 (a)(2) Rock Characteristics, Favorable condition 2.

This favorable condition requires that the host rock have a low thermal conductivity, a low coefficient of thermal expansion, and ability to seal fractures.

The discussion in the EA (Page 6-100) states that the host rock does have a low coefficient of thermal expansion. However, a review of Table 6-6 (Page 6-101) and Table 6-7 (Page 6-102) indicates that the thermal conductivity values are low. This is in direct contradiction to the statement of the favorable condition and a conclusive statement such as, "This favorable condition is present at the reference repository location...." (Page 6-106, paragraph 2), cannot be made at this time. However, the effects of this low thermal conductivity on the rock mass behavior in relation to stability, ground water flow, and isolation capability must be outlined, such that uncertainties associated with compliance with this favorable condition can be dispelled.

The statements "hydrothermal alteration of the basalt... is expected to seal fractures," (Page 6-100, paragraph 2), and "The basalt dense interior is not expected to have sufficient ductility to seal repository related fracture," (Page 6-100, paragraph 5), appear to be mutually inconsistent. Also, the characteristics of hydrothermal alteration appear to be largely conjecture.

The conclusion on the favorable condition may be supplemented with the statement, "However, the thermal conductivity is low and ductility is such that repository related fractures may not be sealed."

6. Postclosure Technical Guideline No. 960.4-2-3 (c)(1) Rock characteristics, Potentially adverse condition 1.

This potentially adverse condition requires that all engineering measures be within reasonably available technology. The conclusion on this condition maintains that this potentially adverse condition is not present at this site.

The discussion on this qualifying condition states however, that "At appropriate packing densities, provided the clay fills the inter connected voids between the crushed rock aggregate and there is a tight interface with the host rock, such a seal can prevent preferential pathways to the accessible environment," (Page 6-104, paragraph 3). Unless the backfill material is formulated and placement methods and placement densities identified, and demonstrated, one cannot conclude that a tight interface can be provided between the seal and host rock interface. Also, in subsequent performance assessment analyses (Section 6.4.2 in the EA), it has been assumed that the seal system is virtually impermeable and all ground water and radionuclide flow takes place through the disturbed rock zone around the repository openings. This is predicated on the assumed performance of the seal system and is not demonstrated.

The discussion on methods of sealing shafts includes the statement, "... the disturbed rock zone joints and fractures could be pressure injected with grout, using grout curtain construction techniques similar to those used to improve rock foundations at dam sites" (Page 6-106, paragraph 1). Grout curtain construction at damsites, and grouting the disturbed rock zone at different depths in an approximately 3000 feet deep shaft may not be directly comparable. It must be demonstrated that the proposed method can be implemented.

It appears that the methods of construction and the performance of the seal system has been dealt with inadequately. The different types of seals that are to be used should be formulated and methods of placement should be outlined. Quality assurance procedures for construction should also be outlined.