



United States Department of the Interior  
BUREAU OF MINES

P. O. BOX 25086  
BUILDING 20, DENVER FEDERAL CENTER  
DENVER, COLORADO 80225  
Denver Research Center  
Ground Control Division

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Mr. David Tiktinsky  
U.S. Nuclear Regulatory Commission  
Engineering Branch  
Division of Waste Management, NMSS  
Washington, DC 20555

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*(B6934)*  
*BDM*

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PDR   
LPDR  *(B, N, S)*

Distribution:  
*Tiktinsky*  
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(Return to WM, 623-SS) \_\_\_\_\_ *st*

Dear Mr. Tiktinsky:

Attached are our selected detail review comments for the draft NNWSI  
Environmental Assessment. If you have any comments please call either me  
or Lindsay Mundell at FTS 776-0737.

Sincerely,

Edward E. Hollop  
Research Supervisor  
Ground Control Division

Enclosure

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Selected Detail Comments

Site: WMEG/EA/NNWSI

Reviewer: K. Hanna

Date: 1/10/85

Chapter: 6

Number: 6BM1

Section: 6.3.1.3.2

Heading: Data Relevant to the Evaluation

Page: 6-175

Paragraph: 1-3

The EA states the determination of mechanical properties of the rock matrix (physical and elastics, etc.), properties of individual fractures, and effects of fractures on rock matrix are under way or planned for the exploratory shaft. Since the overall stability of the repository openings will be dependent on the behavior of the entire rock mass, the properties of the weakness planes should also be determined. The investigation should include the effects of different fluids (groundwater and consistier leakage), fracture filling, varying stress field, and seismic events. The possibility of lithophysal cavities (see Section 6.3.3.2.3, p 6-264, paragraph 2), vitric zones and clay layers acting as weakness planes should be considered, particularly the dehydration of smectite clay layer.

Selected Detail Comments

Site: WMEG/EA/NNWSI

Reviewer: D. Conover

Date: 1/14/85

Chapter: 6

Number: 6BM2

Section: 6.3.1.3.3(1)

Heading: Evaluation of Favorable Condition (1)

Page: 6-178

Paragraph: 3

The EA states, "These faults do not restrict the location of a repository, because the simple presence of a fault is not necessarily detrimental to repositories located in unsaturated rocks; they could, in fact, be advantageous (Roseboom, 1983)."

While potentially advantageous as drainage channels, the presence of faults may present ground control problems severe enough to require buffer zones between faults and emplacement rooms. In addition, ground movement along faults may render inaccessible both completed sections and undeveloped sections, unless additional mining is done.

The reduction in usable area due to fault buffer zones and inaccessible areas, and operating problems caused by fault displacements should be investigated and included in this section and possibly section 6.3.1.3.4 (1).

Selected Detail Comments

Site: WMEG/EA/NNWSI

Reviewer: K. Hanna

Date: 1/10/85

Chapter: 6

Number: 6BM3

Section: 6.3.1.3.3(2)

Heading: Evaluation for Ductility to Seal Fractures

Page: 6-181

Paragraph: 2-4

The ductility and thermal expansion of rock are discussed on page 181 as means to close fractures and joints. The EA states that, "Studies of the effects of water and elevated temperature on the mechanical behavior of rock are underway." These studies do not consider the effect of creep on rock mass due to temperature increase. The creep behavior may adversely affect the stability of the rock and may ultimately close the fractures. Therefore, it is suggested these potential problems be investigated.

Selected Detail Comments

Site: WMEG/EA/NNWSI

Reviewer: R. Stateham

Date: 1/10/85

Chapter: 6

Number: 6BM4

Section: 6.3.1.3.3(2)

Heading: Favorable Conditions Evaluation  
for Thermal Conductivity and  
Thermal Expansion

Page: 6-181 to 6-182

Paragraph: 1-3

The EA states in the conclusion (regarding ductility): "The host rock is not sufficiently ductile to seal fractures," but 2 sentences later the conclusion indicates that sufficient ductility exists by stating that this favorable condition exists. Further effort should be made to identify the effects of fracturing and a clear conclusion drawn regarding the effects of fracturing on ductility.



Selected Detail Comments

Site: WMEG/EA/NNWSI                      Reviewer: D. Conover  
K. Hanna                                      Date: 1/14/85  
Chapter: 6                                      Number: 6BM6  
Section: 6.3.1.3.4(1)                      Heading: Potentially Adverse Conditions  
Page: 6-183                                      (1) Evaluation  
Paragraph: 1-3

The EA states, "The rock is expected to be strong, with little likelihood that blocks would fall on the waste canisters and breach containment, although mining experience will be needed to confirm this expectation."

Although localized failures may not present significant problems, large-scale faulting, or shifting along pre-existing fractures could conceivably rupture canisters and provide a rapid pathway to the water table.

The EA should include a discussion of any proposed design criteria relating to this possibility.

Selected Detail Comments

Site: WMEG/EA/NNWSI                      Reviewer: D. Conover  
K. Hanna                      Date: 1/14/85  
Chapter: 6                                      Number: 6BM7  
Section: 6.3.1.3.4(1)                      Heading: Potentially Adverse Conditions (1)  
Page: 6-183                                      Evaluation  
Paragraph: 3

The EA discusses the plan to remove the concrete shaft liner below repository level when sealing the shaft. This procedure is to be implemented to enhance drainage from the shaft.

A possibility exists for settlement damage to occur within the repository if the rock surrounding the unsupported section of the shaft is allowed to fail. Although this effect should be minor, particularly considering the proposed backfilling plan, the extent of subsidence should be evaluated and documented in the EA.



Selected Detail Comments

Site:	<u>WMEG/EA/NNWSI</u>	Reviewer:	<u>R. Stateham</u>	Date:	<u>1/10/85</u>
Chapter:	<u>6</u>	Number:	<u>6BM9</u>		
Section:	<u>6.3.3.2.3(2)</u>	Heading:	<u>Evaluation-A Host Rock That Would Require Minimal or no Artificial Support to Ensure Safe Repository Operation and Construction</u>		
Page:	<u>6-266</u>				
Paragraph:	<u>3,4,5</u>				

The EA states in these paragraphs that the underground facility will require minimal artificial ground support, and offers as evidence that this technique is employed in G-tunnel at NTS. However conditions exist in the NTS tunnels that may not exist at the repository. For example, the test site tunnels are easily available for maintenance and reinforcement when necessary. This is not likely to be true of a repository during the process of waste emplacement. Furthermore there have been some falls of ground in the NTS tunnels. Because, reinforcement of the ground support system will be difficult and perhaps impractical after waste emplacement begins, the support installed initially may well require more than bolts and mesh wire. This strengthening of the support system would still be in accord with the EA guidelines because: (1) Additional support techniques are well known, commonly used in operating mines, and readily available. In addition this would be in accord with implications of stronger design found in other sections of the EA 6.3.3.4.4(2) & (6.3.3.4.5). It is suggested the ground support design be examined and inclusion of additional support be considered as a routine measure rather than after problems are encountered.

Selected Detail Comments

Site: WMEG/EA/NNWSI      Reviewer: R. Stateham      Date: 1/10/85  
Chapter: 6      Number: 6BM10  
Section: 6.3.3.2.3(2)      Heading: Evaluation-A Host Rock That Would  
Require Minimal or no Artificial  
Support to Ensure Safe Repository  
Operation and Construction  
Page: 6-266  
Paragraph: 3

EA states "The expected support requirements includes (1) 2.5 to 3.0m long, fully grouted bolts..." This type of bolt is bonded to the rock along its entire length when it is functioning properly. It is possible that subjection of this type of support to the 100°-200°C temperatures, expected in the repository, will cause the bond between the rock and the bolt to be broken due to differences in expansion of the bolt and the rock. If this should happen, the rock will be left without artificial support. It is suggested that this potential problem be examined and any necessary changes in the design of the ground support system be included in the EA.



Selected Detail Comments

Site: WMEG/EA/NNWSI      Reviewer: R. Stateham      Date: 1/10/85  
Chapter: 6      Number: 6BM12  
Section: 6.3.3.2.4(3)      Heading: Geotechnical Properties That Could  
Page: 6-270      Necessitate Excessive Maintenance  
Paragraph: 3

The EA states "stability can be maintained with conventional rock bolts and wire mesh." It should be noted that conventional rock bolts are not the same as the fully grouted bolts mentioned in other sections of this report. They are usually considered to be less effective than fully grouted bolts. If conventional bolts are used, their effectiveness in the repository should be evaluated. If the quoted statement refers to fully grouted bolts, see comment for 6.3.3.2.3(2).

### Selected Detail Comments

Site: WMEG/EA/NNWSI      Reviewer: R. Stateham      Date: 1/10/85  
Chapter: 6      Number: 6BM13  
Section: 6.3.3.3.4      Heading: Potentially Adverse Condition  
Page: 281      Evaluation  
Paragraph: 2

The EA states, "Because the potential repository at Yucca Mountain would be located entirely in the unsaturated zone, no significant amounts of groundwater will be encountered." An operating mine in the arid climate of Death Valley (about 25 to 30 miles from Yucca Mountain) has encountered perched water that may adversely affected ground support. The possibility of such water can be expected at Yucca Mountain. The network of openings created at the repository is much more likely to encounter perched water than individual tunnels on NTS, and the effects of such water could be more severe. It is suggested the potential for encountering adverse water condition be reexamined.

Selected Detail Comments

Site: WMEG/EA/NNWSI

Reviewer: R. Stateham

Date: 1/10/85

Chapter: 6

Number: 6BM14

Section: 6.3.3.4.5

Heading: Evaluation

Page: 6-290

Paragraph: 2

The EA states evidence has been reported from a number of mines and tunnels in which earthquake damage at depth is less than at the surface (Pratt, et. al., 1978). There is no clear distinction between shallow and deep in this reference and the Yucca Mountain repository could possibly be considered shallow. Some of the mines reported are at depths of a 1,000 m (somewhat deeper than the proposed repository). Pratt, et. al., concludes, "More damage is reported in shallow, near-surface tunnels than in deep mines.

Specifically, data are very sparse below 500m." Seemingly this implies a dividing line between deep and shallow that is below the proposed repository depth. The same reference indicates (fig. 1, p. 14, Pratt, et. al. 1978) the proposed repository is in an area of risk of major damage. It is suggested the risk of potential damage to the repository be given further study and evaluation.

Selected Detail Comments

Site: WMEG/EA/NNWSI

Reviewer: R. Stateham

Date: 1/10/85

Chapter: 6

Number: 6BM15

Section: 6.3.4.1.3

Heading: Evaluation for Repository Siting

Page: 6-296

Paragraph: 1

The EA states, "wire mesh and rock bolts should provide sufficient ground support." See comments on sections 6.3.3.2.3(2).

Selected Detail Comments

Site: WMEG/EA/NNWSI

Reviewer: R. Stateham

Date: 1/10/85

Chapter: 6

Number: -

Section: 5.2.1

Heading: Geologic Impacts

Page: 5-35

Paragraph: 1

The EA states "Heat...would only affect a small volume of rock..." Heat will affect all of the overlying rock. Migration rate to the surface can be calculated if necessary. This heat will undoubtedly affect plant life on the surface.

Selected Detail Comments

Site: WMEG/EA/NNWSI

Reviewer: R. Stateham

Date: 1/10/85

Chapter: 6

Number: -

Section: 6.2.1.5.5

Heading: A Site Shall be Disqualified if  
Atomic Energy Defense Activities  
in the Proximity are Expected

Page: 6-42

Paragraph: 2

The EA uses Vortmans calculations for a repository designed to withstand 0.75 g acceleration. The proposed Yucca Mountain repository is expected to be designed to withstand 0.4g acceleration (a less stringent standard). Consequently, determinations of minimum distances from nuclear deformations should be re-done and evaluated.

Selected Detail Comments

Site: WMEG/EA/NNWSI      Reviewer: R. Stateham      Date: 1/10/85  
Chapter: 6      Number: -  
Section: 6.3.3.4.6      Heading: Evaluation and Conclusion for  
Qualifying Condition on the  
Page: 6-292      Preclosure Ectonics  
Paragraph: last

The conclusion sites reference 10CFR960.5-1(a)(3). There is no such paragraph number in 10CFR960. What reference did the writer intend to cite?