

MAR 31 1994

Mr. Robert R. Loux, Executive Director
 Agency for Nuclear Projects
 Nuclear Waste Project Office
 Capitol Complex
 Carson City, Nevada 87910

Dear Mr. Loux:

The purpose of this letter is to respond to the State of Nevada's January 25, 1994, letter (R. Loux to B. J. Youngblood) which expressed concerns with the U.S. Department of Energy's (DOE) activities related to construction of the Yucca Mountain Project Exploratory Studies Facility (ESF). The concerns expressed in the State of Nevada's letter were based on information provided by a State of Nevada contractor (Thompson Engineering) and addressed the results of the ESF Package 2B for the 90 percent design review, and information gathered at various interactions with DOE. Based on that information, the State of Nevada requested that the U.S. Nuclear Regulatory Commission staff review DOE's ESF design program and supporting documents and consider stating the NRC concerns to DOE in the form of an objection.

In a letter dated August 20, 1993 (B.J. Youngblood to D. Shelor), the NRC staff expressed concerns with DOE's activities related to the ESF design and design control process. These concerns were considered serious enough that the NRC staff believed DOE should address them prior to initiating tunnel boring activities into the repository block area. In a letter dated November 18, 1993, DOE responded to NRC staff concerns from the August 20, 1993, letter. Subsequently, in the NRC staff's response to the DOE letter (Holonich to Shelor dated 3/30/94), we noted that progress has been made towards resolution of NRC staff concerns. However, the NRC staff indicated that it was unable to verify that the actions taken by DOE have been properly implemented and, until this verification is accomplished through audits, surveillances and design reviews, the NRC staff concerns remain unresolved. Nevertheless, based on these interactions and reviews, the NRC staff considers that an objection is not appropriate at this time.

The NRC staff's responses to the State of Nevada's other concerns expressed in the January 25, 1994, letter are enclosed. It is the understanding of the NRC staff that concern 1 raises the issue that construction of the ESF will preclude the characterization of potential barriers to the flow of air (gas, vapor) through Yucca Mountain. For concern 1, the NRC staff does not feel at this time there is sufficient technical information to support an objection. However, while the NRC staff cannot support an objection at this time, it is aggressively investigating the issues raised in the State of Nevada's pneumatic pathways concern. As part of this effort, we intend to consult experts and to request further information from DOE. We intend to request information from DOE on (1) the importance of air pressure data to site description, (2) the potential for the ESF to impact the collection of air pressure and air chemistry data, and (3) the accelerated surface based testing

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plans ability to collect air pressure and air chemistry data. It is the intent of the NRC staff to keep the State of Nevada informed of progress on the NRC staff's exploration of the pneumatic pathways concern through normal correspondence. In the responses to State of Nevada concerns 4 and 5, the NRC staff notes that it has expressed similar concerns to DOE. For concerns 2 and 3, the NRC staff will continue to observe and evaluate these issues through bi-monthly ESF meetings, technical exchanges, and design reviews.

Thank you for your comments. Should you have any questions related to this letter or NRC staff review of ESF design and design process, please contact William Belke of my staff at (301) 504-2445.

Sincerely,

^{15/}
B. J. Youngblood, Director
Division of High-Level Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated

- cc: T. J. Hickey, Nevada Legislative Committee
- J. Meder, Nevada Legislative Counsel Bureau
- D. Shelor, DOE
- R. Nelson, YMPO
- M. Murphy, Nye County, NV
- M. Baughman, Lincoln County, NV
- D. Bechtel, Clark County, NV
- D. Weigel, GAO
- P. Niedzielski-Eichner, Nye County, NV
- B. Mettam, Inyo County, CA
- V. Poe, Mineral County, NV
- F. Mariani, White Pine County, NV
- R. Williams, Lander County, NV
- L. Fiorenzi, Eureka County, NV
- J. Hoffman, Esmeralda County, NV
- C. Schank, Churchill County, NV
- L. Bradshaw, Nye County, NV

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MNataraja, HLGE	KMcConnell,	SChern, HLGE	WFord,HLHP

* See previous concurrence

OFC	HLPD	HLPD*	HLGE*	E	HLHP*	E	HLWN	HLWN
NAME	WBelke	JHolonich	RBallard	MFederline	JLInehan	BJYoungblood		
DATE	03/15/94	03/17/94	03/17/94	03/18/94	03/17/94	03/17/94		

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Mr. Robert R. Loux

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the NRC staff's exploration of the pneumatic pathways concern through normal correspondence. In the responses to State of Nevada concerns 4 and 5, the NRC staff notes that it has expressed similar concerns to DOE. For concerns 2 and 3, the NRC staff will continue to observe and evaluate these issues through bi-monthly ESF meetings, technical exchanges, and design reviews.

Thank you for your comments. Should you have any questions related to this letter or NRC staff review of ESF design and design process, please contact William Belke of my staff at (301) 504-2445.

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 J. Meder, Nevada Legislative Counsel Bureau
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 C. Schank, Churchill County, NV
 L. Bradshaw, Nye County, NV

D. Shelor, Doc

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| MNataraja, HLGE | KMcConnell, | SChern, HLGE | WFord, HLHP |

* See previous concurrence

OFC	HLPD*	HLPD*	HLGE*	HLHP	HLWM	HLWM
NAME	WBelke	JHolonich	RBallard	MFederline	JLinehan	BJYoungblood
DATE	03/16/94	03/17/94	03/17/94	03/18/94	03/ /94	03/ /94

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Thank you for your comments. Should you have any questions related to this letter or NRC staff review of ESF design and design process, please contact William Beike of my staff at (301) 504-2445.

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NRC STAFF RESPONSES TO STATE OF NEVADA EXPLORATORY STUDIES FACILITY CONCERNS

CONCERN 1: Whether important data collection relative to characterization of pneumatic pathways and conditions might be precluded by proceeding with Exploratory Studies Facility (ESF) construction prior to completion of necessary surface-based investigations.

NRC STAFF RESPONSE: For this concern, the NRC staff does not feel at this time, there is sufficient technical information to support an objection. It is the NRC staff's understanding that the State of Nevada's pneumatic pathway concern focuses on the ability of the site characterization program to adequately characterize barriers to the flow of air (gas, vapor) through Yucca Mountain. The NRC staff's understanding of the State of Nevada's concern has evolved from a number of communications and interactions, namely:

1. C. Johnson letter to B.J. Youngblood dated February 4, 1993, which initially brought the State of Nevada's concern to the attention of the NRC staff.
2. NRC staff attendance at the Scientific Roundtable Interaction on Yucca Mountain Pneumatic Continuity in Las Vegas, Nevada, from January 26 to 27, 1994, where the State of Nevada's concern was discussed with representatives and contractors of the State of Nevada, Nye County, and the DOE.
3. Phone conversation with M. Mifflin (consultant to State of Nevada and Nye County) on February 25, 1994, discussing his understanding of the pneumatic pathway concern.
4. R. Loux to B.J. Youngblood letter dated January 25, 1994.

It is the understanding of the NRC staff that the State has expressed a general concern that construction of the ESF will preclude characterization of potential barriers to the flow of air (gas, vapor) through Yucca Mountain. The State has identified three locations which warrant investigation, because of their potential to act as pneumatic barriers. These areas are: (1) the Paintbrush nonwelded unit overlying the Topopah Spring welded unit, (2) the Topopah Spring welded unit outcrop in Solitario Canyon, and (3) the Solitario Canyon fault in Solitario Canyon. The State of Nevada feels adequate characterization of these potential flow barriers is necessary to model the post closure movement of water vapor. This concern is based on the State of Nevada's observation that all proposed repository designs will heat the rock and some of the proposed designs may move large amounts of vapor. As a result, the State of Nevada is concerned that large amounts of water will be redistributed in the mountain and that barriers to gas flow could significantly affect that distribution.

The State of Nevada proposes that large scale tests are needed to adequately characterize the mountain with respect to the possible existence of flow barriers. These tests would reflect the bulk pneumatic properties of large volumes of rock. The State of Nevada has proposed that air pressure and chemistry data be obtained from units above, below, and in the Paintbrush nonwelded unit in the areas of

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interest (i.e., Yucca Mountain and Solitario Canyon). Further, the pressure data should be collected long enough to record pressure changes during periods when weather conditions are causing significant air pressure changes over the site. This would allow a large volume of rock to experience significant pressure changes, so that air pressures in and on either side of a potential flow barrier can be monitored for changes. The State of Nevada is concerned that excavation of the ESF below the Paintbrush nonwelded unit could make it impossible to use this technique. The State of Nevada is also concerned that excavation of the ESF below the Paintbrush nonwelded unit could make it impossible to use differences in gas chemistry above and below potential pneumatic barriers to determine if they exist. It is feared that the ESF could "short circuit" the influence of the potential Paintbrush nonwelded unit barrier by causing large scale pressure and air chemistry changes below the Paintbrush nonwelded unit.

The NRC staff is currently investigating the State of Nevada's concern and at this time does not feel there is sufficient technical information to support an objection. The NRC staff cannot support a decision that (1) establishing the existence or nonexistence of a pneumatic barrier is necessary for licensing, (2) the ESF will cause irreversible/unmitigable effects on the ability to characterize the pneumatic pathway concern, and (3) that the ESF will preclude the collection of needed air pressure and air chemistry data. For example, some published modeling studies indicate that for high heat loads repository moisture distribution is most dependent on thermal properties and not on hydrologic or pneumatic properties (Buscheck, 1993). It also may be possible to mitigate the effects of the ESF by tunnel sealing or may be possible at some future date to isolate portions or all of the ESF from atmospheric pressure changes. In addition, the ESF may not preclude the ability to collect needed air pressure data. This is because even if the ESF causes large scale air pressure effects, some information could be collected (perhaps at smaller scales) from borehole air injection tests. The NRC staff is also uncertain that ESF pressure and gas chemistry effects will extend a large distance into the rock or that the accelerated surface based testing program will not be able to collect the needed air pressure and air chemistry data.

The NRC staff is aggressively investigating the issues raised in the State of Nevada's pneumatic pathways concern. As part of this effort, we intend to consult experts and to request further information from the DOE on (1) the importance of this air pressure data to site description, (2) the potential for the ESF to impact the collection of air pressure and air chemistry data, and (3) the accelerated surface based testing plans ability to collect air pressure and air chemistry data. It is the intent of the NRC staff to keep the State of Nevada informed of progress on the NRC staff's exploration of the pneumatic pathways concern through normal correspondence.

REFERENCES CITED:

Buscheck, T.A. and Nitao, J.J., 1993, The Analysis of Repository-Heat-driven Hydrothermal Flow at Yucca Mountain, High Level Radioactive Waste Management, Proceedings of the Fourth Annual International Conference, Las Vegas, Nevada, April 26-30, 1993, pp 847-867.

CONCERN 2: DOE appears to be abandoning the conceptual design which emerged from DOE's ESF Alternatives Study, in favor of a revision, now referred to as the "enhanced" design.

NRC STAFF RESPONSE: DOE has proposed enhancements to the current ESF design in response to its internal review comments and new interpretations of available site information. The major changes proposed in the enhanced ESF design include changes to slope of the ramps and changes to the configuration of main tunnel in the Topopah Spring level in order to avoid intersecting the Ghost Dance fault in numerous locations. The elevations of repository blocks have also been modified. However, the basic concept to use two ramps and one optional shaft is the same as in ESF Alternatives Study Option 30. DOE has adopted a phased approach for the ESF design and construction, and has made several detailed presentations of its approach. The design and construction of the ESF have been divided into ten phases. The NRC staff has been observing DOE's reviews of 50% and 90% ESF design for the various packages and raising comments and concerns as appropriate. DOE has been responsive in addressing NRC's concerns and comments. The NRC staff has not raised any major concerns on DOE's approach related to the enhanced ESF design. We will continue to observe ESF design reviews as appropriate.

CONCERN 3: Redesign of the ESF is now underway on a fast track, in order to meet DOE's schedule for beginning tunnel construction with the tunnel boring machine (TBM).

NRC STAFF RESPONSE: The NRC staff notes the State of Nevada's concern related to DOE's fast-track approach to the ESF design. The NRC staff continues to review and evaluate DOE's ESF design and construction process using the following criteria:

- (a) Will all the necessary information for site characterization be gathered during and after the ESF construction?
- (b) Is there adequate integration of site technical data with ESF design and construction?
- (c) Is there an appropriate level of integration between the ESF design and the Geologic Repository Operations Area (GROA) design?
- (d) Are the impacts of ESF construction and testing on long-term performance evaluated appropriately?

The NRC staff believes this is an ongoing activity throughout the ESF design and construction stage. The NRC staff will continue to participate in DOE's ESF design package reviews, relevant technical exchanges, and "site visits" to observe ESF design/construction and data collection activities. Quality assurance audits will also be attended to evaluate DOE's progress using the above mentioned criteria.

CONCERN 4: Some of the design plans for the recent Package 2B were moving forward without having DOE complete the appropriate Determination of Importance Evaluations (DIE), and with limited, if any, coordination and integration with other program interests and participants.

NRC STAFF RESPONSE: At the 90 percent design review held in Las Vegas, Nevada, January 5-7, 1994, for Package 2B, the NRC staff commented that at the 90 percent design review stage, over half of the items and activities were still under evaluation for determining whether they are important to safety (ITS) or important to waste isolation (ITWI). The NRC staff further commented that when a design is almost completed (e.g., 90 percent stage) it would appear prudent that designers should have supportive evidence based on definitive technical evaluations to determine whether the item or activity is ITS or ITWI. It was explained to the NRC staff that Package 2B involved procurement studies and that the items in this package are temporary and also can be procured as commercial items, and if any quality application is necessary, the item will be repaired or upgraded. The NRC staff requested clarification on this comment at the 90 percent design review and documented this request in a February 18, 1994, letter from J. Holonich to D. Shelor.

The NRC staff On-Site Licensing Representative has learned that for future design reviews, the practice of having uncompleted DIE's at 90 percent design reviews would be modified. This concern was also briefly discussed at the February 23, 1994, NRC/DOE meeting on Quality Assurance (at which the State of Nevada representative was present). It is our understanding from this meeting that DIE's will be complete for all practical purposes, at the 90 percent design review stage. Should changes to the design affect the DIE, it will be modified accordingly.

CONCERN 5: Adoption of the new ESF conceptual design appears to be moving forward without consideration of a newly recognized fault zone which intersects the Ghost Dance fault zone and appears to transect the repository block in a northwesterly direction.

NRC STAFF RESPONSE: The impacts of Ghost Dance fault and Sundance fault on the ESF design and excavation are unclear, because DOE has not submitted the related documents to the NRC for review. DOE must consider the impacts of Ghost Dance and Sundance faults (and for that matter, any other faults that may be discovered) on the ESF design as well as the GROA design. Furthermore, in its draft NRC staff technical position (March 1993) on, "Consideration of Fault Displacement in Repository Design", the NRC staff outlined its expectations with respect to the presence of faults in the repository block and locating structures, systems, and components important to safety and/or waste isolation. For the design of the geologic repository, DOE should take into account the attendant effects of faults such as the Ghost or Sundance, and seek early resolution of fault-related design and performance issues. The NRC staff will continue to review the DOE's ESF design packages with particular attention on the above mentioned fault zones.