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MAY 24 1988

MEMORANDUM FOR: B. Joe Youngblood, Chief  
Operations Branch  
Division of High-Level Waste Management, NMSS

FROM: Ronald L. Ballard, Chief  
Technical Review Branch  
Division of High-Level Waste Management, NMSS

SUBJECT: EVALUATION OF NNWSI PROJECT'S RESPONSE TO INFORMATION  
REQUESTS FROM THE APRIL 14-15, 1987, MEETING BETWEEN THE  
DOE AND NRC

REFERENCES: (1) Letter, Gertz (WMPO) to Linehan (NRC), dated  
October 16, 1987  
(2) Letter, Gertz (WMPO) to Linehan (NRC), dated  
October 29, 1987  
(3) Summary of DOE/NRC Meeting on Proposed Changes to the  
Nevada Nuclear Waste Storage Investigations  
Exploratory Shaft Facility, April 14-15, 1987

In References (1) and (2), the NNWSI Project provided responses to the following Information Requests (IR's) identified during the DOE/NRC meeting on the NNWSI Exploratory Shaft Facility (Ref. 3):

- IR Ib. Because of the change in construction method for the proposed second shaft, DOE should provide reasonable assurance that the shafts are adequately separated so that construction in one shaft does not adversely affect ability to obtain required data in the second shaft and adjacent test areas.
- IR IIIa. Adopt adequate drift construction controls to meet 10 CFR 60 pre/post-closure performance requirements.
- IR IIIc. Provide assurance that the planned drift lengths and directions are adequate for characterizing each of the target fault zones.
- IR IV. Describe measures to be taken to avoid interference of tests from drifting operations and with each other.
- IR Vb. Describe how the construction methods would include provisions to minimize shaft wall damage.

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IR Vc. Demonstrate that there will be minimal interference with testing from underground construction activities. In particular, address the potential for:

- movement of construction fluids through fractures from ES-2 to ES-1 test areas.
- damage to test instruments from blasting vibrations.

My staff has reviewed the NNWSI Project's response and, based on this review, has concluded that the NNWSI Project has satisfactorily responded to Information Request Nos. IIIa and IIIc. However, additional clarification needs to be provided by the NNWSI Project with respect to Information Request Nos. Ib, IV, Vb, and Vc.

Our detailed evaluation of the response to each of the Information Requests addressed by NNWSI is provided in the attachment of this memorandum. Please forward this evaluation to the NNWSI Project. If you have any questions on this staff evaluation, please contact Dr. Dinesh Gupta of my staff.

*BS*

Ronald L. Ballard, Chief  
Technical Review Branch  
Division of High-Level Waste Management, NMSS

Attachment:  
As stated

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ATTACHMENT

NRC STAFF EVALUATION OF THE NNWSI PROJECT RESPONSE TO INFORMATION REQUESTS Ib,  
IIIa, IIIc, IV, Vb AND Vc FROM THE APRIL 14-15, 1987, MEETING BETWEEN THE DOE  
AND NRC

IR Ib. Because of the change in construction method for the proposed second shaft, DOE should provide reasonable assurance that the shafts are adequately separated so that construction in one shaft does not adversely affect ability to obtain required data in the second shaft and adjacent test areas.

In response to this information request, the NNWSI Project has responded that the zone of mechanical influence is small relative to the shaft separation; therefore, convergence and stress interaction between the two shafts are inconsequential.

We agree with the NNWSI Project's conclusion that the zone of mechanical influence is likely to be inconsequential compared with the distance between ES-1 and ES-2. However, we consider that the response to this information request is inadequate and implies that the information request has been misunderstood. The NRC information request was based on the proposed change in construction methods (from boring to blasting). The NNWSI response does not address the consequences of the proposed changes in analyzing the adequacy of shaft separation.

To complete the response to our information request, the NNWSI Project should address the interaction effects resulting from drill and blast excavation (e.g., contamination of some of the test samples by drill water, blasting fumes and blast vibrations). The NNWSI Project's analysis of the adequacy of the shaft separation should also consider realistic worst-case scenarios (e.g., consequences of a substantial shaft failure on data gathering from the other shaft). Preventive actions against such an occurrence should also be considered. The relevant details should include a construction schedule and relative locations of various instruments with respect to shafts.

IR IIIa. Adopt adequate drift construction controls to meet 10 CFR 60 pre/post-closure performance requirements.

In response to this Information Request, the NNWSI Project has stated that "to control the amount of damage to the surrounding rock, smooth blasting, a type of controlled blasting, will be used." The NRC staff agrees with the NNWSI Project that, if adequate controls (including frequent test blasts, vibration monitoring, and evaluation of changes in permeability around drift walls) are used during excavation, smooth wall blasting would induce only minor damage to

drift walls. We consider that since the planned approach is likely to lead to only limited damage around openings, the effect of drift construction on the ability of the repository to meet the 10 CFR 60 pre/post-closure performance requirements is likely to be small. However, as mentioned in Information Request IIIb, the NNWSI Project should recognize that penetrating the targeted geological/hydrological structures (Ghost Dance Fault, Drill Hole Wash, and the imbricate normal fault system) may require remedial measures to maintain the post closure isolation capability of the repository.

In view of the NNWSI Project's position that smooth wall blasting procedure will be used for drift construction, we consider the NNWSI Project's response to be satisfactory.

IR IIIc. Provide assurance that the planned drift length and directions are adequate for characterizing each of the target fault zones.

In response to this Information Request, the NNWSI Project has stated that projections of the target features to the drift intercept were predicted based on the surface expressions of the target features and knowledge of the geology. Some uncertainty involved in predicting the target locations (i.e., drift-fault intersection) has been recognized. It is stated that since the dips of the features are not well known, a wedge of uncertainty of  $\pm 10^\circ$  was assumed.

In its response, the NNWSI Project has not provided adequate information concerning characterization of the target zones. The NRC staff expects that this information will be forthcoming in the NNWSI SCP. The staff will review this information during the SCP review.

In view of the inherent uncertainties involved in extrapolating underground structural locations from surface features, we consider NNWSI's response to the Information Request regarding planned drift lengths and directions to be satisfactory.

IR IV. Describe measures to be taken to avoid interference of tests from drifting operations and with each other.

In response to this information request, the NNWSI Project has pointed out that mining sequence plans are still under consideration; however, there should be little interference between the drifting operation and testing because adequate separation, in space, in time, or both, between testing and drifting will ensure that there will be little interference.

The NRC staff considers that the NNWSI project has not adequately described the measures to be taken to avoid interference of tests from drifting operations and with each other. The NNWSI Project needs to provide additional information to satisfactorily respond to this request. The Information should include (i) layout of testing area with locations of various tests identified thereon; (ii) Identification of tests that would be more sensitive to interference by

vibrations, dust, water, fumes, other intrusions and drifting operations; (iii) sequence and schedules of construction and testing, (iv) mining methods, including discussion of total quantity of water to be used for drilling (water flush or water mist), total charge and type of explosives and fumes it can generate, and (v) discussion of adequacy of separation of various tests from each other to avoid interference.

The NRC staff is concerned about the interference caused by locating the second shaft (ES-2) so close to the test area, and within the same traffic loop as the test area. This shaft is likely to be extensively used for hauling muck from the drift excavation. Traffic vibrations and dust caused by these operations could interfere with sensitive testing to be conducted in the test area over a period of time. The NRC staff is also concerned about the potential interference caused by the proximity of sensitive tests to ES-1. The NNWSI Project has not addressed this issue in sufficient detail in its response.

Our Information Request also pointed out the need for the NNWSI Project to discuss the interference of tests with each other. The NNWSI Project response does not address this issue. The increase of approximately 2,500 ft of drifts in the test area should provide additional flexibility in better distributing the locations of site characterization tests. The NNWSI Project should describe provisions used to better distribute the locations of tests and to sufficiently separate tests from each other to avoid interference.

IR Vb. Describe how the construction methods would include provisions to minimize shaft wall damage.

In response to this Information Request, the NNWSI Project has stated that the recommended blasting procedure for the construction of both ES-1 and ES-2 is smooth blasting. Also, to assure best possible results with respect to limiting damage to the wall rock with smooth blasting, a comprehensive quality control procedure is planned to be developed and closely monitored. The need for adjustments in blasting procedures along the shaft wall is also recognized.

The NRC staff agrees with the general approach and construction methods to be used by the NNWSI Project for minimizing shaft wall damage. The staff will review further details of the procedures when submitted by the NNWSI project. In future submittals, the NNWSI Project should also consider and discuss the necessary reinforcement and support that may be required for the worst-case scenario where, for example, severe localized stability problems may be encountered. We consider that the response to our Information Request should be further amplified when details are available.

IR Vc. Demonstrate that there will be minimal interference with testing from underground construction activities. In particular, address the potential for:

- movement of construction fluid through fractures from ES-2 to ES-1 test areas.
- damage to test instruments from blasting vibrations.

The first part of the DOE response discusses movement of fluids and states that only small amounts of water will be introduced, that they will remain in the immediate area where they are introduced, and that preliminary studies confirm that water will not travel to the adjacent shaft or test areas. Studies are in progress to quantify these fluid transport predictions.

The second part of the response postulates that blasting effects due to 30-lb charges will be inconsequential at 300 to 100 foot distances. Effects at shorter distances (less than 50 feet) will be determined in prototype tests planned prior to the ESF start.

We consider that the NNWSI Project has not satisfactorily responded to the issue of potential interference with testing from underground construction activities. Specifically, the NNWSI Project needs to provide quantitative estimates of water injection pressures and volumes in detail and should provide analysis of the distance traveled. The results of this analysis should be analyzed with respect to planned locations of tests and sampling.

The NNWSI Project should also discuss the potential for blasting fumes to interfere with testing and sampling.

With respect to potential damage to test instruments from blasting vibrations, we agree that a limit of 30 lb/delay should limit vibrations at large distances and should be helpful in limiting the damage to test instruments. However, the NNWSI Project needs to provide preliminary details of the locations of these instruments with respect to the shaft bottom to demonstrate that damage will be controlled.