

JUN 22 1993

Mr. Dwight Shelor, Associate Director for
Systems and Compliance
Office of Civilian Radioactive Waste Management
U.S. Department of Energy, RW 30
Washington, DC 20585

Dear Mr. Shelor:

SUBJECT: REVIEW OF U.S. DEPARTMENT OF ENERGY (DOE) STUDY PLAN
"CHARACTERIZATION OF THE VERTICAL AND LATERAL DISTRIBUTION OF
STRATIGRAPHIC UNITS WITHIN THE SITE AREA," REVISION 2

In a letter to the U.S. Department of Energy (DOE) dated December 14, 1992, the Nuclear Regulatory Commission informed DOE that the NRC staff's Phase I review had identified no objections with any of the activities proposed in the study plan, "Characterization of Vertical and Lateral Distribution of Stratigraphic Units within the Site Area" (Study Plan 8.3.1.4.2.1). At that same time, NRC also indicated that it had decided to proceed with a Detailed Technical Review of that study plan, using the Review Plan for NRC Staff Review of DOE Study Plans, Revision 1 (December 6, 1990).

Revisions 1 and 2 of this study plan were received by the NRC staff subsequent to the December 14, 1992, letter. Those revisions were considered by the staff as part of its detailed technical review.

On March 22, 1993, DOE transmitted its responses to three informal comments embodied within the December 14 letter. Those responses addressed 1) study plan references, 2) borehole sealing, and 3) geophysical survey coverage of the Little Skull Mountain earthquake area. The staff agrees that the reference-related concern has been resolved based on changes in Revisions 1 and 2 of the study plan. The staff also agrees to defer its concern regarding geophysical survey coverage to Study Plan 8.3.1.17.4.3, currently undergoing review by the NRC staff.

Based on its detailed review of the subject study plan, the staff has identified two concerns in the form of questions related to the sealing of boreholes. To the staff's knowledge, no borehole seal design has been proposed either in the Site Characterization Plan (SCP) or in subsequent documents. The SCP identifies (pages 8.4.3-38 to 8.4.3-43) potentially adverse effects associated with unsealed boreholes (both shallow and deep). To the staff's knowledge, the SCP provides no guidance as to those portions of the site for which no borehole seal design is required. Although no borehole seal design has been proposed by DOE, a number of boreholes have already been plugged or sealed. Therefore, the staff recommends that DOE provide information on the seals design(s), describe how proposed sealing will be used to mitigate adverse effects of drilling and coring operations, and describe procedures and rationale for discriminating between boreholes requiring a designed seal and those that are plugged with a variety of materials and apparently require no designed seal.

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The questions related to this study plan will be tracked by the NRC staff as open items similar to Site Characterization Analysis (SCA) objections, comments, and questions. NRC recommends timely resolution of these open items due to their importance to site characterization activities.

The staff also believes that SCA Comment 51 is relevant and should be considered in future revisions to the subject study plan. Comment 51 recommends that DOE consider 1) revising the planned layout of its geophysical surveys to that of a grid in order to achieve the study plans's stated goal of acquiring a reliable three-dimensional characterization of the rock units and 2) the integration of geophysical surveys conducted under Study Plan 8.3.1.4.2.2 (Characterization of Structural Features Within the Site Area) with those surveys planned for the subject study plan.

If you have any questions concerning this letter or the enclosure, please contact Charlotte Abrams (301) 504-3403 of my staff.

Sincerely,

/s/

Joseph J. Holonich, Director
Repository Licensing and Quality Assurance
Project Directorate
Division of High-Level Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated

- cc: R. Loux, State of Nevada
- T. J. Hickey, Nevada Legislative Committee
- C. Gertz, DOE/NV
- 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. Sperry, White Pine County, NV
- R. Williams, Lander County, NV
- L. Fiorenzi, Eureka County, NV
- L. Vaughan II, Esmeralda County, NV
- C. Shank, Churchill County, NV
- L. Bradshaw, Nye County, NV

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Study Plan 8.3.1.4.2.1 Characterization of the Vertical and Lateral Distribution of Stratigraphic Units Within the Site Area

QUESTION 1

What is the status of the seal design for boreholes?

BASIS

- The study plan states on page 2-17, "The drilling and coring operations, which may have some impact on the site area, are being conducted independently of the activity here being described." No reference is given to an activity that describes what the potential impacts are and how they might be mitigated.
- The SCP (DOE, 1988), pages 8.4.3-38 through 8.4.3-43, states that boreholes will not have adverse effects on performance because the boreholes will be sealed. The SCP does not describe the sealing system that will prevent adverse effects.
- In a February 12, 1992, letter from L. S. Costin of Sandia National Laboratories (SNL) to J. Russell Dyer of the Yucca Mountain Site Characterization Project Office, regarding a performance assessment for borehole UE25 VSP-2 (UZ-16), it is stated, "the borehole should be sealed upon closure, as it may represent a potential preferential pathway for gaseous radionuclides".
- In Appendix D of a January 31, 1992, memo to Steven R. Sobolik (SNL) from Joseph A. Fernandez (SNL) and John B. Case (IT Corporation), it is shown that the design of a seal has an impact on the performance of the seal.
- On Page 2-143 of Progress Report Number 7 (DOE 1992), it is stated, "A review of technologies to seal underground openings continued."
- In its March 22, 1993, letter (Shelor to Holonich) DOE indicated that (1) borehole sealing is not covered by Study Plan 8.3.1.4.2.1 (Characterization of the Vertical and Lateral Distribution of Stratigraphic Units Within the Site Area), and (2) important aspects of the sealing program will be covered under the not-yet-developed Study Plan 8.3.3.2.2.1 (Seal Material Properties Development) and a SNL report "Development of Strategy to Seal Boreholes" which is expected in May 1993.
- It is recognized by the staff that Study Plan 8.3.3.2.2.1 and the SNL report will provide information on borehole sealing, but it is not clear that even when these documents become available that they will address the design concerns of the NRC staff regarding borehole sealing.

RECOMMENDATION

Given the recognition that boreholes and the adequacy of their seals could have an impact on the performance of the site, it is recommended that DOE discuss how Study Plan 8.3.3.2.2.1 and the SNL borehole seal strategy report will satisfy the requirements of 10 CFR 60.15(c)(1), which states that site characterization activities should be conducted as to limit the adverse effects on long-term performance. It is also recommended that DOE discuss how the seal design for these activities meets the design criteria of 10 CFR 60.134(a). The discussion should include (1) a description of the seals for boreholes that would help limit the adverse effects, and (2) a description of the analyses of the adequacy of the seal design.

REFERENCES

Sandia National Laboratories, 1992a, Letter from L. S. Costin, SNL, to J. R. Dyer, DOE; Subject: Performance assessment evaluation of impacts of drilling, testing, and operations on waste isolation for proposed borehole UE25 VSP-2 (UZ-16), dated February 12, 1992, 2 p., 1 enclosure with attachment.

Sandia National Laboratories, 1992b, Appendix D from the Memorandum from J. A. Fernandez, SNL, and J. B. Case, ITC, to S. R. Sobolik; Subject: Evaluation of the performance of UZ-16, dated January 31, 1992, p. 30-39.

U.S. Department of Energy, 1992a, Letter from D. E. Shelor, DOE, to J. J. Holonich, NRC; Subject: Responses to three comments contained in the U.S. Nuclear Regulatory Commission's December 14, 1992, letter to J. P. Roberts, DOE, transmitting NRC's Phase I review of Study Plan 8.3.1.4.2.1, dated March 22, 1993, 2 p., 2 enclosures.

U.S. Department of Energy, 1992b, Site characterization progress report: Yucca Mountain, Nevada, April 1, 1992 - September 30, 1992, number 7: Office of Civilian Radioactive Waste Management, Washington, D.C.

U.S. Department of Energy, 1988, Site characterization plan: Yucca Mountain Site, Nevada Research and Development Area, Nevada: DOE/RW-0199, Office of Civilian Radioactive Waste Management, Washington, D.C.

Study Plan 8.3.1.4.2.1 Characterization of the Vertical and Lateral Distribution of Stratigraphic Units Within the Site Area

QUESTION 2

Although a borehole seal design has not yet been provided, a number of boreholes have recently been sealed (plugged). Lacking a borehole seal design, what specifications are being used for the sealing (plugging) of these boreholes?

BASIS

- The SCP (DOE, 1988) in pages 8.4.3-38 through 8.4.3-43 states that boreholes will not have adverse effects on performance because the boreholes (both shallow and deep) will be sealed. The SCP describes three categories of borehole-related impacts. The potential impact categories include those associated with three types of disturbances (hydrologic, geochemical and thermal/mechanical). No seal design is proposed in the SCP. Additionally, the SCP does not describe how the sealing system will prevent adverse effects.
- The SCP (pages 8.4.3-38 through 8.4.3-43) does not identify the type of borehole for which a designed seal is not required.
- The summary of the Field Testing Coordination Meeting (DOE, 1993) indicates that six repository surface facilities boreholes (RF3, RF3B, RF5, RF9, RF10 and RF11) have been plugged.
- The map entitled "Existing and Proposed Drillholes Within 10 Km of the Site" (DOE, 1992) indicates that the depths of the plugged boreholes range from 60 feet to 301 feet.
- In a February 12, 1992, letter from L. S. Costin of Sandia National Laboratories (SNL) to J. R. Dyer of the Yucca Mountain Site Characterization Project Office, regarding a performance assessment for borehole UE25 VSP-2 (UZ-16), it is stated, "no grout should be placed in selected sealing areas which contain fractures, to ensure that introduction of potentially unsuitable grouts into those sealing areas containing fractures does not occur."
- In its March 22, 1993, letter (Shelor to Holonich) DOE indicated that (1) borehole sealing is not covered by Study Plan 8.3.1.4.2.1 (Characterization of the Vertical and Lateral Distribution of Stratigraphic Units Within the Site Area), and (2) important aspects of the sealing program will be covered under the not-yet-developed Study Plan 8.3.3.2.2.1 (Seal Material Properties Development) and a SNL report "Development of Strategy to Seal Boreholes" which is expected in May 1993.

- It is recognized by the staff that Study Plan 8.3.3.2.2.1 and the SNL report will provide information on borehole sealing, but it is not clear that even when these documents become available that they will address the concerns identified in this question.

RECOMMENDATION

Although borehole seal design has not yet been completed, a number of boreholes have recently been sealed (plugged). DOE should consider providing (1) the bases for sealing of boreholes prior to the design of the seal and (2) the bases for discriminating between those boreholes requiring sealing and those boreholes for which sealing is not required. Further, DOE should also consider describing the results and potential effect on repository performance resulting from the plugging of boreholes prior to development of the seal design.

REFERENCES

- Sandia National Laboratories, 1992, Letter from L. S. Costin, SNL, to J. R. Dyer, DOE; Subject: Performance assessment evaluation of impacts of drilling, testing, and operations on waste isolation for proposed borehole UE25 VSP-2 (UZ-16), dated February 12, 1992, 2 p., 1 enclosure with attachment.
- U.S. Department of Energy, 1988, Site characterization plan: Yucca Mountain Site, Nevada Research and Development Area, Nevada: DOE/RW-0199, Office of Civilian Radioactive Waste Management, Washington, D.C.
- U.S. Department of Energy, 1992, Existing and proposed drillholes within 10 km of the site: Map - YMP-92-081.0, compiled in June 1992 by EG&G/EM Remote Sensing Laboratory.
- U.S. Department of Energy, 1993a, Letter from D. E. Shelor, DOE, to J. J. Holonich, NRC; Subject: Responses to three comments contained in the U.S. Nuclear Regulatory Commission's December 14, 1992, letter to J. P. Roberts, DOE, transmitting NRC's Phase I review of Study Plan 8.3.1.4.2.1, dated March 22, 1993, 2 p. 2 enclosures.
- U.S. Department of Energy, 1993b, Yucca Mountain Project Office, Las Vegas, Nevada, field testing coordination meeting summary, surface based testing field activities: Miscellaneous Investigations, January 28, 1993, 3 p.