COMPLIANCE DETERMINATION STRATEGY RRT 3.2.1.10 POTENTIALLY ADVERSE CONDITION: EVIDENCE OF EXTREME EROSION

APPLICABLE REGULATORY REQUIREMENTS:

10 CFR 60.21(c)(1)(ii)(B) 10 CFR 60.21(c)(1)(ii)(F) 10 CFR 60.122(c)(16)

TYPES OF REVIEW:

Acceptance Review (Type 1) Safety Review (Type 3)

RATIONALE FOR TYPES OF REVIEW:

Acceptance Review (Type 1) Rationale:

This regulatory requirement topic is considered to be license application-related because, as specified in the license application content requirements of 10 CFR 60.21(c) and the regulatory guide "Format and Content for the License Application for the High-Level Waste Repository" (FCRG), it must be addressed by the U.S. Department of Energy (DOE) in its license application. Therefore, the staff will conduct an Acceptance Review of the license application for this regulatory requirement topic.

Safety Review (Type 3) Rationale:

This regulatory requirement topic is considered to be related to containment and waste isolation. It is a requirement for which compliance is necessary to make a safety determination for construction authorization as defined in 10 CFR 60.31(a) (i.e., regulatory requirements in Subparts E, G, H, and I). Therefore, the staff will conduct a Safety Review of the license application to determine compliance with this regulatory requirement topic.

This regulatory requirement topic, concerning a potentially adverse condition (PAC), evidence of extreme erosion, focuses on DOE's demonstration, through appropriate investigations, of the evidence for (or against) extreme erosion within the controlled area during the Quaternary Period. In addition, such investigations shall extend beyond the controlled area if it is ascertained that extreme erosion might adversely impact isolation within the controlled area.

Evidence of extreme erosion during the Quaternary Period is to be characterized by DOE in order to understand the projected effect of such erosion, if present, on the waste isolation capability of the proposed geologic repository. DOE is expected to look in the geologic record for evidence of extreme erosion during the 2,000,000 or so years before the present (Quaternary Period) by identifying the types and extent of erosion which might be classified as "extreme." The NRC staff has defined "extreme erosion" as "the occurrence of substantial changes in landforms (as a result of erosion) over relatively short intervals of time" (see NRC, 1983, p. 382).

Sufficient technical knowledge exists to allow for an adequate investigation and evaluation of the likelihood of this PAC. Based on information already known about the site and nearby environs related to this review plan topic, the analysts conclude that a safety determination can be made by evaluating the

Safety Review:

The regulatory requirement topic is limited to consideration of DOE's demonstration, through appropriate investigations, of the evidence for (or against) extreme erosion during the Quaternary Period within the controlled area (and outside the controlled area, if considered necessary). For regulatory purposes, the definition of the Quaternary Period is 2 million years (see NRC, 1983, p. 373). The specific aspects of the license application on which the reviewer will focus are described below and the acceptance criteria are identified in Section 3.0 of this review plan.

In conducting the Safety Review, the reviewer will, at a minimum, determine the adequacy of the data and analyses presented in the license application to support DOE's demonstrations regarding 10 CFR 60.122(c)(16). Specifically, DOE will need to: (1) provide information to determine whether and to what degree evidence of extreme erosion during the Quaternary Period is present; (2) provide information to determine to what degree evidence of extreme erosion during the Quaternary Period is present, but undetected; (3) assure the sufficiency of the lateral and vertical extent of the data collection; and (4) evaluate the information presented in support of Items (1) and (2), with assumptions and analysis methods that adequately describe the presence (or absence) of evidence of extreme erosion during the Quaternary Period and ranges of relevant parameters.

DOE will also need to provide an explanation of the measures used to support models used to assess the presence or absence of evidence of extreme erosion during the Quaternary Period. Analyses and models that will be used to predict future conditions and changes in the geologic setting shall be supported by using an appropriate combination of such methods as field tests, *in-situ* tests, laboratory tests that are representative of field conditions, monitoring data, and natural analog studies.

In conducting the aforementioned evaluations, the reviewer should determine that DOE uses: (1) analyses that are sensitive to evidence of extreme erosion during the Quaternary Period; and (2) assumptions which are not likely to underestimate its effects. In general, the reviewer will assess the adequacy of DOE's investigations for evidence of extreme erosion during the Quaternary Period, both within the controlled area and outside the controlled area, as necessary.

In order to conduct an effective review, the reviewer will rely on staff expertise and independently acquired knowledge, information, and data such as the results of research activities being conducted by the NRC's Office of Nuclear Regulatory Research, in addition to that provided by DOE in its license application. The reviewer should focus on additional data which can refine knowledge of extreme erosion during the Quaternary Period, and should acquire, as necessary, additional information to confirm the resolution capabilities of the methodologies. It is incumbent upon the reviewer to have acquired a body of knowledge regarding these and other critical considerations in anticipation of conducting the review to assure that DOE's erosion program is sufficient in scope and depth to provide the information necessary for resolution of the concerns. The DOE site characterization program for erosion, although concentrating on fluvial and hillslope erosion, is designed to address additional 10 CFR Part 60 regulatory requirements related to design and performance issues (see DOE, 1988, pp. 8.3.1.6-1 - 8.3.1.6-4).

RATIONALE FOR REVIEW STRATEGY:

Not applicable.

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APPLICABLE REGULATORY REQUIREMENTS FOR EACH TYPE OF REVIEW:

<u>Type 1:</u> 10 CFR 60.21(c)(1)(ii)(B) 10 CFR 60.21(c)(1)(ii)(F)

<u>Type 3:</u> 10 CFR 60.122(c)(16)

REFERENCES:

Nuclear Regulatory Commission, "Staff Analysis of Public Comments on Proposed Rule 10 CFR Part 60, 'Disposal of High-Level Radioactive Waste in Geologic Repositories'," Office of Nuclear Regulatory Research, NUREG-0804, December 1983.

Nuclear Regulatory Commission, "Format and Content for the License Application for the High-Level Waste Repository," Office of Nuclear Regulatory Research. [Refer to the "Products List" for the Division of High-Level Waste Management to identify the most current edition of the FCRG in effect.]

U.S. Department of Energy, "Chapter 8, Section 8.3.1.6, Erosion," in "Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada," Office of Civilian Radioactive Waste Management, DOE/RW-0199, Vol. V, Part B, December 1988.