UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 8, 1994

Mr. Dwight E. Shelor
Associate Director for Systems and Compliance
Office of Civilian Radioactive Waste Management
U.S. Department of Energy
Washington, DC 20545

SUBJECT: STAFF EVALUATION OF OPEN ITEM RESPONSES ON WASTE PACKAGE DESIGN AND WASTE PACKAGE FAILURE MODES

Dear Mr. Shelor:

In your letter to Joseph J. Holonich dated July 1, 1994, the U.S. Department of Energy (DOE) submitted supplemental responses to open questions presented in the U.S. Nuclear Regulatory Commission's Site Characterization Analysis (SCA). The purpose of this letter is to provide the NRC staff evaluations of those supplemental responses. Based on its review of these responses, the staff considers SCA Questions 35 and 45 to remain open and SCA Question 51 to be resolved (see Enclosure). Summarized below are Questions 35, 45, and 51, and the staff's evaluation of DOE's supplemental responses to these questions.

In SCA Question 35, the NRC staff asked if DOE's acceptance criteria for a waste package helium leak test is consistent with the performance requirements for the engineered barrier system. In the DOE supplemental response to SCA Question 35, DOE described its new performance goal for waste packages (i.e., mean waste package lifetimes well in excess of 1000 years), but did not provide any assessment or information that demonstrated that the helium leak test acceptance criteria are consistent with the performance requirements of 10 CFR 60.113. The NRC staff considers that this question remains open. To resolve this open item question, NRC staff considers that DOE needs to provide information on the consequences (in terms of radionuclide releases) of permitting waste packages that have small leaks (i.e., leaks that result in flow rates less than DOE's proposed leak acceptance criteria) to remain in the repository at closure.

In SCA Question 45, the NRC staff asked what investigations are planned to establish particulate source terms for the waste package, particulate retention factors by containing vessels, and plateout and gravitational settlement factors for the geologic repository operations area during accident conditions in the preclosure phase. In its supplemental response to Question 45, DOE reiterated its position that ". . . spent nuclear/high-level defense particle generation and the attendant size distribution are not (MGDS) site-specific problems (i.e., site characterization), but are design questions associated with nuclear waste activities." DOE also summarized the results of a recently completed investigation ("a preliminary MGDS/ESF preclosure safety analysis") and described the process that they will use to determine the need for future data collection and analyses. The NRC staff considers that particle generation and the attendant size distribution issues should be addressed in DOE's Site Characterization Plan (SCP) (10 CFR 60.17) and in NRC's review of site characterization activities (10 CFR 60.18). Accordingly, the NRC staff considers that this question remains open, since DOE's summary of the preclosure safety analysis is insufficient to enable the staff to review that analysis. To resolve this open item question, the NRC staff considers that DOE should submit the preliminary MGDS/ESF preclosure safety analysis for NRC review. This is appropriate because the scope of the SCP includes DOE's total repository program, including site investigation, design, and performance assessment.

In SCA Question 51, the NRC staff asked if DOE had considered the impacts to the waste package site characterization program related to Idaho National Engineering Laboratory (INEL) and Hanford high-level wastes. In the DOE supplemental response to this question, DOE stated that the potential number of waste canisters from INEL and Hanford waste had been factored into the waste stream analysis for the potential repository at Yucca Mountain. DOE also described the process it proposes for accepting nonstandard or alternative waste forms, such as those that may be developed for INEL and Hanford high-level wastes. The NRC staff considers that this question is resolved.

As you know, DOE and NRC are planning a technical exchange, in December 1994, on Substantially Complete Containment. At that technical exchange, the NRC staff expects that DOE will discuss the consequences (in terms of radionuclide releases) of DOE's new performance goal (i.e., mean waste package lifetimes well in excess of 1,000 years with waste package failures during the containment period predicted to be around 1 percent) and of DOE's post-closure waste package failure criterion (i.e., a waste package failure is a breach large enough to allow an air flow of 1 x 10-4 atm-cm3/s into the package). I recommend that DOE also include, in their presentation, a discussion of the consequences (in terms of radionuclide releases) of the proposed DOE pre-closure leak test acceptance criteria discussed in the supplemental response for Question 35.

If you have any questions regarding this letter or would like to discuss these SCA questions further, please contact David Dancer of my staff. Mr. Dancer can be reached at (301) 415-6618.

Sincerely,

Michael J. Bell, Chief
Engineering and Geology Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated
cc: See attached list

DISTRIBUTION: * w/encl
*Central File *DWM r/f JGreeves *JSurmeier JAustin JHolonich
NMSS r/f *ENGB r/f PUBLIC LSS CNWRA On-site Rep.
Mark Small Boxes in Concurrence Block to Define Distribution Copy Preference.
In small Box on "OFC:" line enter: C = Cover E = Cover & Enclosure N = No Copy
PATH & FILE NAME: S:\DWM\ENGB\DMD\WPFM

OFC	*ENGB		*ENGB	E	*PAHB		*ENGB	E	
NAME	DDancer DD		JThoma JT		MFederline MF		MBell JT for MB		
DATE	11/1/94		11/2/94		11/5/94		11/8/94		/94

OFFICIAL RECORD COPY
mIn small Box on "DATE:" line enter: M= E-Mail Distribution Copy H = Hard Copy
PDR : YES X NO ___ Category: Proprietary ___ or CF Only ___
ACNW: YES X NO ___
IG : YES ___ NO X Delete file after distribution: Yes X No ___

Attached List Dated 11/8/94

R. Loux, State of Nevada
T. J. Hickey, Nevada Legislative Committee
J. Meder, Nevada Legislative Counsel Bureau
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

NRC STAFF EVALUATION OF DOE RESPONSES TO SITE CHARACTERIZATION ANALYSIS QUESTIONS 35, 45, AND 51

Enclosure

Section 8.3.4.2.G Waste package fabrication and handling before emplacement.

Design goal for closure.
p.8.3.4.2-30 para. 6.

SCA QUESTION 35

It is stated that the closure process will be capable of being performed and inspected under remote conditions with a reliability such that the containment would be capable of passing a standard helium leak test at the level of 1 x 10^{-7} atm-cm^3/sec.

What is the basis for the helium leak test acceptance criteria?

EVALUATION OF DOE SUPPLEMENTAL RESPONSE

- In the NRC Site Characterization Analysis, the NRC staff recommended that DOE provide the basis for the helium leak test acceptance criteria and demonstrate that the criteria are consistent with the performance requirements of 10 CFR Part 60.113 for the engineered barrier system.

- In the December 14, 1990, DOE response to this question, DOE cited ASME Section V, Article 10, Appendix IV, 1986 as the basis for the helium leak test acceptance criteria and indicated that the criteria will be assessed further during waste package design. However, DOE did not provide any assessment or information that demonstrated that the helium leak test acceptance criteria are consistent with the performance requirements of 10 CFR 60.113.

- In the July 1, 1994, DOE supplemental response to this question, DOE described its new performance goal for waste packages (i.e. mean waste package lifetimes well in excess of 1000 years) but did not provide any assessment or information that demonstrated that the helium leak test acceptance criteria are consistent with the performance requirements of 10 CFR 60.113.

- The NRC staff considers that the information provided in the supplemental response to Question 35 is insufficient and that Question 35 remains open. To resolve this open item question, NRC staff considers that DOE needs to provide information on the consequences (in terms of radionuclide releases) of permitting waste packages that have small leaks (i.e leaks that result in flow rates less than DOE's proposed leak acceptance criteria) to remain in the repository at closure.

Section 8.3.5.5.1 *Information Need 2.3.1: Determination of credible accident sequences and their respective frequencies applicable to the repository.*

SCA QUESTION 45

The SCP does not identify whether additional data are needed to establish particulate source terms for the waste package, particulate retention factors by containing vessels, or plateout or gravitational settlement factors for the geologic repository operations area during accident conditions in the preclosure phase. What investigations are planned?

EVALUATION OF DOE SUPPLEMENTAL RESPONSE

- In the December 14, 1990 response to this question, DOE recognized that additional data are needed to establish particulate source terms for the waste package, particulate retention factors by containing vessels, and gravitational settlement factors for the geologic repository operations area. However, DOE did not describe any plans for the investigations necessary to obtain this data. Furthermore, DOE stated its position that such data are not related to site specific problems and should not be included as part of site characterization plans.

- In the July 1, 1994, supplemental response to this question, DOE reiterated its position that "spent nuclear/high-level defense particle generation and the attendant size distribution are not (MGDS) site-specific problems (i.e. site characterization), but are design questions associated with nuclear waste activities."

- In the July 1, 1994 DOE supplemental response to Question 45, DOE summarized the results of an investigation they have recently completed (i.e. "a preliminary MGDS/ESF preclosure safety analysis"). In that investigation DOE considered two initiating events (rock falls and waste transporter accidents) that could result in accidental releases to the accessible environment. DOE noted that it had to make estimates for spent nuclear fuel/high-level defense waste particulate generation from accidental energetic encounters, particle retention in containment systems and structures, and the mitigating effects of plateout and fallout. DOE asserted that adequate detail was found on the plateout and fallout processes to allow reasonable yet conservative estimates to be made for both particle attrition during transport in the operations areas and particle egress from breached waste containers. DOE noted that the issue of particle generation will be addressed by analyses for Determination of Importance Evaluations for the systems and components for waste package transfer, transport, and emplacement operations. DOE further noted that potential data needs are being reviewed by performance assessors to ensure that effort is deployed in those area that have the larger impact on dose consequences.

- The NRC staff considers that particle generation and the attendant size distribution issues should be addressed in DOE's site characterization plan (10 CFR 60.17) and in NRC's review of site characterization activities (10 CFR 60.18). Accordingly, the NRC staff considers that this question remains open, since DOE's summary of the preclosure safety analysis is insufficient to enable the staff to review that analysis. To resolve this open item question, the NRC staff considers that DOE should submit the preliminary MGDS/ESF preclosure safety analysis for NRC review.

Section 8.3.5.10 Issue resolution strategy for Issue 1.5: Will the waste package and repository engineered barrier system meet the performance objective for radionuclide release rates as required by 10 CFR 60.113?

Section 7.3.1.1.2 High-level wastes

Section 7.4.3.2 Glass waste form performance research

SCA QUESTION 51

Has DOE considered the impacts to the waste package site characterization program related to INEL and Hanford high-level wastes?

EVALUATION OF DOE SUPPLEMENTAL RESPONSE

- In the December 14, 1990, response to this question, DOE cited report DOE/RL-90-27 (1990) as the basis for the selection of borosilicate glass for the Hanford high-level wastes and indicated that it would assess the impact of INEL wastes after additional information and selection of the waste form for those wastes had been made. However, DOE did not discuss how the quantity and characteristics of INEL and Hanford wastes might impact Site Characterization Plan planning and tests and ultimate disposition.

- In the July 1, 1994, supplemental response to this question, DOE stated that the potential number of waste canisters from INEL and Hanford wastes had been factored into the waste stream analysis for the potential repository at Yucca Mountain. DOE also pointed out DOE's Waste Acceptance System Requirements Document (DOE/RW-0315, Revision 1) addresses the acceptance of both standard borosilicate glass waste forms as well as non-standard waste forms, should they be developed by INEL or Hanford. The supplemental response describes the procedure DOE would go through if non-standard waste forms are to be proposed for acceptance into the civilian waste management system.

- The NRC staff considers this question to be resolved.