



**Department of Energy**  
Office of Civilian Radioactive Waste Management  
Yucca Mountain Site Characterization Office  
P.O. Box 30307  
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QA: N/A

**AUG 16 2001**

**OVERNIGHT MAIL**

C. William Reamer, Chief  
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Office of Nuclear Materials Safety  
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**OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT (OCRWM) QUALITY  
ASSURANCE (QA) AUDIT OBSERVER INQUIRIES FROM AUDITS M&O-ARP-01-01  
AND M&O-ARP-01-02**

Reference: Ltr, Reamer to Milner, dtd 7/5/01

The referenced letter requested responses to open Audit Observer Inquiries (AOI) from previous U.S. Nuclear Regulatory Commission (NRC) observations, specifically, AOI Numbers M&O-ARP-01-01-01 and M&O-ARP-01-02-04. Enclosed are the U.S. Department of Energy's (DOE) responses to these two inquiries.

As noted in the referenced letter, the three remaining open inquiries, AOI Numbers M&O-ARP-01-02-01, M&O-ARP-01-02-02, and M&O-ARP-01-02-03 were addressed in the NRC/DOE Technical Exchange on Total System Performance Assessment and Integration.

Please direct any questions on these responses to Timothy C. Gunter at (702) 794-1343.

Stephan Brocoum  
Assistant Manager, Office of  
Licensing and Regulatory Compliance

OL&RC:TCG-1462

Enclosure:  
As stated

NHSS07

AUG 16 2001

cc w/encl:

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cc w/o encl:

N. K. Stablein, NRC, Rockville, MD  
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cc w/o encl: (continued)

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**Responses to Office of Civilian Radioactive Waste Management (OCRWM) Quality Assurance NRC Audit Observer Inquiry from Audit M&O-ARP-01-01-01**

**M&O-ARP-01-01-01**

Several agreements made at the NRC/DOE Technical Exchange (January 9-12, 2001, Pleasanton, CA) on Evolution of the Near Field Environment (ENFE) indicate that new data and analyses will be presented in the *Engineered Barrier System: Physical and Chemical Environment Model AMR* (ANL-EBS-MD-000033), expected to be available in FY 02. The following NRC/DOE agreements point specifically to the FY 02 revision of this AMR; ENFE 2.04, ENFE 2.06, ENFE 2.08, ENFE 2.11, ENFE 2.13, and ENFE 2.18. ENFE 2.05 and ENFE 2.17 also point to this AMR, although the information can be provided in other documents, as appropriate. During the M&O-ARP-01-01 audit of ANL-EBS-MD-000033, Revision 01 in Las Vegas, NV (Feb.20-23, 2001), however, audit team members questioned the usefulness of producing additional revisions of this AMR. If data and analyses required to fulfill NRC/DOE agreements listed above are not presented in a FY 02 revision of the ANL-EBS-MD-000033 AMR, where will this information be presented?

**Response**

The Engineered Barrier System Department is conducting a review of the Physical and Chemical Environment Model (ANL-EBS-MD-000033) to determine whether or not this AMR will be revised. An alternative to revising this AMR is extracting those models and analyses that will be carried forward and incorporating them into the appropriate revised Engineered Barrier System AMRs. If this alternative is selected, then existing NRC/DOE agreements that point to AMR ANL-EBS-MD-000033 will be addressed in revised Engineered Barrier System AMRs, a mapping of agreements, and a proposed revision to the NRC/DOE agreement in this area would be provided to NRC.

The Project will be performing the detailed planning for FY 02 from May – September 2001. Therefore, we expect that the specific documentation vehicle and schedule will be available in the FY 02 project plan when issued.

ENCLOSURE

**Responses to Office of Civilian Radioactive Waste Management (OCRWM) Quality Assurance NRC Audit Observer Inquiry from Audit M&O-ARP-01-02-04**

**M&O-ARP-01-02-04**

The work upon which this model is based (Flint et al., 1996, *Conceptual and Numerical Model of Infiltration at Yucca Mountain*) is unqualified. See OCRWM QA Audit Report M&O APR-00-04) (p.9). Was information used to support conclusions in the Infiltration AMR? If yes, describe how the Flint et al. (1996) data was qualified and assumptions verified. The NRC requests additional information and details.

**Response**

The 1996 infiltration model and data which is discussed in the Flint, et al., 1996, report *Conceptual and Numerical Model of Infiltration for the Yucca Mountain Area, Nevada* is considered to be qualified and suitable for use in the intended application of the model (i.e., to provide an upper boundary condition for the site-scale unsaturated-zone flow and transport model). The development and documentation of the 1996 model was subject to the U. S. Geological Survey (USGS) quality-assurance (QA) program, in place at the time the work was performed. The model and documentation were reviewed and accepted by the DOE September 30, 1996, with QA Designation "Q." The model and associated data were submitted to the Technical Data Management System (TDMS) under Data Tracking Number: GS960908312211.003 with Qualification Status designated as "Qualified." The Flint, et al., 1996 report was also prepared under the USGS QA program and submitted to the DOE, as Level 3 Deliverable 3GUI623M, *Synthesis of Unsaturated Zone Infiltration Yucca Mountain Area, WBS 1.2.3.3.1.2.1*. The Description/Completion Criteria that were specified by the DOE stipulated that the *Quality Assurance Requirement and Description (QARD)* "applies to this effort."

Flint et al. (1996) contains a statement that the downward advance of the infiltration wetting front was rapid and there is "saturated fracture flow" at borehole UZ-N15. During audit M&O APR-00-04 in January 2000, the Audit Team attempted to locate independent evidence to support these statements by examining water-potential data from other nearby boreholes. The Audit Team conducted a search of DTN GS960908312211.003 (Flint et al. model data set) in an attempt to find the data for borehole UZ-N16. The search for the data was unsuccessful, which may have led the Audit Team to conclude that the work was unqualified. One set of source data for Flint's DTN GS960908312211.003 is DTN GS000408312231.004 that was submitted to the Records processing Center in April 2000 to supercede an older incomplete DTN. GS000408312231.004 was found to contain water-potential data for borehole UZ-N16.

The conceptual and numerical models of net infiltration for Yucca Mountain developed by Flint et al. describe and simulate the natural hydrologic system. The models were based on thorough analysis of extensive field data collected during 1984 through 1995. These models were used as a key input to the current (1999) model documented in the infiltration AMR, *Simulation of Net Infiltration for Modern and Future Potential Climates* (ANL-NBS-HS-000032, Rev.00 ICN 01). The AMR does not completely replace the 1996 model, but supplements and enhances the 1996 model, particularly with respect to evapotranspiration from the root zone and the infiltration of surface run-on in the channels of washes. In addition, the current (1999) model uses updated model inputs for bedrock geology and soil depth. All source data, references, models, routines and procedures are described, noted or referenced in the AMR for complete tracking of all analyses. All assumptions used to obtain estimates of net infiltration are described. The AMR consists of (1) modifications to the 1996 model code INFIL V1.0 (Flint et al., 1996), (2) an updating of input parameters defining the new model INFIL V2.0., (3) calibration of the new model using stream flow records, (4) the development of daily climate input representative of potential future climate stages, and (5) application of the model to provide net-infiltration estimates for a lower, mean, and upper bound climate scenario within each potential future climate stage. The AMR was developed under the current OCRWM quality assurance program procedures and is fully qualified for use.