

June 20, 2001

Stephan Brocoum, Assistant Manager
Office of Licensing and Regulatory Compliance
U.S. Department of Energy
Office of Civilian Radioactive Waste Management
Yucca Mountain Site Characterization Office
P.O. Box 30307
North Las Vegas, NV 89036-0307

SUBJECT: UNSATURATED AND SATURATED FLOW UNDER ISOTHERMAL
CONDITIONS (USFIC) KEY TECHNICAL ISSUE AGREEMENTS

Dear Mr. Brocoum:

During two Technical Exchange and Management Meetings held on August 16-17 and October 31 to November 2, 2000, the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Department of Energy (DOE) reached agreement on issues pertaining to the Unsaturated and Saturated Flow Under Isothermal Conditions (USFIC) Key Technical Issue (KTI). The NRC staff has reviewed the wording of these agreements and believe that some of them need clarification. In addition, some of the agreements do not have due dates assigned or specify where DOE plans to document the additional justification or information. The agreements in question are further discussed in the enclosure.

Based on the review of DOE documents and the NRC staff's understanding of ongoing testing, the staff has identified additional information it feels will be necessary for the NRC to review prior to making a determination on whether USFIC Subissues 3 and 4 are resolved. Based on our discussions with your staff, it is our understanding that these issues can be discussed at the upcoming Total System Performance Assessment and Integration meeting. We have included these issues in the enclosure to be consistent with what has been provided to you informally. In addition, the NRC believes that two agreements can be listed as complete. This information is also included in the enclosure.

If you have any questions regarding this letter, please contact Mr. James Andersen of my staff. He can be reached at (301) 415-5717.

Sincerely,

/RA/ NKS for CWR

C. William Reamer, Chief
High-Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated
cc: See attached distribution list

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Letter to S. Brocoum from C.W. Reamer dated: June 20, 2001

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**Clarification of NRC/DOE Agreements and
Discussion of New Items Pertaining to the
Unsaturated and Saturated Flow Under Isothermal Conditions Key Technical Issue**

The U.S. Nuclear Regulatory Commission (NRC) goal of issue resolution during this interim pre-licensing period is to assure that the U.S. Department of Energy (DOE) has assembled enough information on a given issue for NRC to accept a license application for review. Resolution by the NRC staff during pre-licensing does not prevent anyone from raising any issue for NRC consideration during the licensing proceedings. Also, and just as importantly, resolution by the NRC staff during pre-licensing does not prejudge what the NRC staff evaluation of that issue will be after it's licensing review. Issues are resolved by the NRC staff during pre-licensing when the staff has no further questions or comments about how DOE is addressing an issue. Pertinent new information could raise new questions or comments on a previously resolved issue.

This enclosure addresses several NRC/DOE agreements made during the Unsaturated and Saturated Flow Under Isothermal Conditions (USFIC) Technical Exchange and Management Meetings (see NRC letters dated October 23 and November 17, 2000, which summarized the meetings). In addition, this enclosure addresses several new items which have risen based on the NRC staff's understanding of ongoing testing and the review of DOE documents.

1) Clarification of USFIC Agreements

a) A response by the DOE, including where the information will be documented and when the NRC will receive it, is needed for some of the agreements made during the USFIC Technical Exchange and Management Meetings, specifically, Subissue 4, Agreements 1 through 5.

b) USFIC Subissue 4, Agreement 1

Wording of the Agreement: The ongoing and planned testing (see Attachment 3) are a reasonable approach for a licensing application with the following comments: (a) for Alcove 8-Niche 3, consider a mass balance of water; (b) monitor evaporation during all testing; and (c) provide testing plans and consider NRC comments, if any. [Attachment 3 outlined ongoing testing and modeling activity descriptions].

Problems with Wording: Attachment 3 has created some confusion as to what information the NRC needs DOE to provide. The clarified wording below requests some of the testing plans from Attachment 3 as originally intended by the NRC, as well as the results from several tests and model studies. The NRC believes that adding the request for testing and model study results to this agreement is more efficient than adding a number of new USFIC agreements.

Wording of the Clarified Agreement: The ongoing and planned testing are a reasonable approach for a licensing application with the following comments:

- i) Consider a mass balance of water for the Alcove 8 - Niche 3 Cross-over test.
- ii) Monitor evaporation during all testing.

- iii) Provide the documentation of the test plan for the Passive Cross Drift Hydrologic test.
- iv) Provide the NRC with any Cross Drift seepage predictions that may have been made for the Passive Cross Drift Hydrologic test.
- v) Provide documentation of the results obtained and the analysis for the Passive Cross Drift Hydrologic test. This documentation should include the analysis of water samples collected during entries into the Cross Drift (determination whether the water comes from seepage or condensation).
- vi) Provide the documentation of the test plan for the Alcove 7 test.
- vii) Provide documentation of the results obtained and the analysis for the Alcove 7 test. This documentation should include the analysis of water samples collected during entries into Alcove 7 (determination whether the water comes from seepage or condensation).
- viii) Provide the documentation of the test plan for the Niche 5 test.
- ix) Provide documentation of the results obtained and the analysis for the Niche 5 test.
- x) Provide documentation of the results obtained and the analysis for the Systematic Hydrologic Characterization test.
- xi) Provide documentation of the results obtained and the analysis for the Niche 4 test.
- xii) Provide documentation of the results obtained from the calcite filling test. Include interpretations of the observed calcite deposits found mostly at the bottom of the lithophysal cavities.
- xiii) Provide documentation of the results obtained from the Comparison of Continuum and Discrete Fracture Network Models modeling study. Alternatively, provide justification of the continuum approach at the scale of the seepage model grid.
- xiv) Provide documentation of the results obtained from the Natural Analogs modeling study. The study was to apply conceptual models and numerical approaches developed from Yucca Mountain to natural analog sites with observations of seepage into drifts, drift stability, radionuclide transport, geothermal effects, and preservation of artifacts.

c) USFIC Subissue 4, Agreement 5

Wording of the Agreement: Provide the analysis of geochemical data used for support of the flow field below the repository.

Wording of the Clarified Agreement: Provide the analysis of geochemical and hydrological data (water content, water potential, and temperature) used for support of the flow field below the repository, particularly in the Calico Hills, Prow Pass, and Bullfrog hydrostratigraphic layers. Demonstrate that potential bypassing of matrix flow pathways below the area of the proposed

repository, as opposed to the entire site-scale model area, is adequately incorporated for performance assessment.

d) USFIC Subissue 5, Agreement 4

Wording of the Agreement: Provide additional information to further justify the uncertainty distribution of flow path lengths in the alluvium. This information currently resides in the Uncertainty Distribution for Stochastic Parameters AMR. DOE will provide additional information, to include Nye County data as available, to further justify the uncertainty distribution of flowpath lengths in alluvium in updates to the Uncertainty Distribution for Stochastic Parameters AMR and to the Saturated Zone Flow and Transport PMR, both expected to be available in FY 2002.

Clarification Needed: The NRC staff does not believe that this agreement needs to be rewritten, however, it would like to confirm that the effects of water table rise on groundwater flux will be addressed in the two documents cited by DOE for this agreement.

2) Completed USFIC Agreements

a) USFIC Subissue 5, Agreement 7

Wording of the Agreement: Provide all the data from SD-6 and WT-24. Some of this data currently resides in the Technical Data Management System, which is available to the NRC and CNWRA staff. DOE will include any additional data from SD-6 and WT-24 in the Technical Data Management System in February 2001.

NRC Review: By letters dated March 2 and April 30, 2001, DOE provided the data from SD-6 and WT-24.

Additional Information Needed: None at this time.

Status of Agreement: USFIC Subissue 5, Agreement 7 is complete.

b) USFIC Subissue 5, Agreement 14

Wording of the Agreement: Provide the updated SZ FEPs AMR. DOE will provide the updated Features, Events, and Processes in Saturated Zone Flow and Transport AMR in February 2001.

NRC Review: By letter dated March 2, 2001, DOE provided "Features, Events, and Processes: Saturated Zone Flow and Transport" (ANL-NBS-MD-000002, Rev 01, ICN 00). The NRC staff has reviewed the document as it pertains to this agreement and believes that its concerns have been captured in the preliminary agreements from the May 15-17, 2001, Technical Exchange and Management Meeting on the Total System Performance Assessment and Integration Key Technical Issue. Therefore, this agreement can be listed as complete.

Additional Information Needed: None at this time.

Status of Agreement: USFIC Subissue 5, Agreement 7 is complete.

3) New Items

Based on the NRC staff review of DOE's documents and activities, the staff has identified additional information it feels will be necessary for the NRC to review prior to making a determination on whether USFIC Subissues 3 and 4 are resolved. Based on our discussions with your staff, it is our understanding that these issues can be discussed at the upcoming Total System Performance Assessment and Integration meeting. We have included these issues here to be consistent with what has been provided to you informally.

a) USFIC Subissue 3: The UZ AMR U0010, Simulation of Net Infiltration for Modern and Potential Future Climates, notes that the simulation results using three synthetic meteorological data sets are averaged for the lower, mean, and upper bound estimates of net infiltration. The NRC is interested in obtaining two of the three synthetic meteorological data sets: 4JA.s01 and Area12.s01.

b) USFIC Subissue 4: The NRC is interested in how the results of the Passive Cross Drift Hydrologic and Alcove 8 - Niche 3 Cross-over tests were used to validate or modify the values used for the flow focusing factor in the seepage model for performance assessment. In addition, the NRC is interested in the justification for the van Genuchten alpha for fracture continuum (α_f) parameter.

c) USFIC Subissue 4: The NRC is interested in additional justification on how fracture continuum properties (i.e., porosity, spacing, aperture) for the unsaturated transport model are calculated and how the active-fracture concept is integrated into these parameter values. The discussion should show that the matrix-diffusion and active-fracture models are properly integrated.

d) USFIC Subissue 4: The NRC is interested in an update to the calibrated unsaturated zone flow model using the most recent matrix saturation and water potential data that suggest the rock mass is wetter than previous core-sample saturation measurements have indicated.

4) Other Items

On February 9, 2001, the NRC provided four audit observer inquiries related to the AMR No. U0010 (ANL-NBS-000032), "Simulation of Net Infiltration for Modern and Potential Future Climates," Revision 00, ICN 01. Please provide an estimate for when the NRC will receive the DOE response for the following Audit Observer Inquiries:

a) Audit Observer Inquiry No. M&O-APR-01-02-1, dated February 9, 2001, for ANL-NBS-HS-00032. Refer to U.S. NRC's Observation Audit Report No. OAR-01-03.

b) Audit Observer Inquiry No. M&O-APR-01-02-2, dated February 9, 2001, for ANL-NBS-HS-00032. Refer to U.S. NRC's Observation Audit Report No. OAR-01-03.

c) Audit Observer Inquiry No. M&O-APR-01-02-3, dated February 9, 2001, for ANL-NBS-HS-00032. Refer to U.S. NRC's Observation Audit Report No. OAR-01-03.

d) Audit Observer Inquiry No. M&O-APR-01-02-4, dated February 9, 2001, for ANL-NBS-HS-00032. Refer to U.S. NRC's Observation Audit Report No. OAR-01-03.