CNWRA A center of excellence in earth sciences and engineering

A Division of Southwest Research Institute[™] 6220 Culebra Road • San Antonio, Texas, U.S.A. 78228-5166 (210) 522-5160 • Fax (210) 522-5155

> July 30, 2002 Contract No. NRC-02-97-009 Account No. 20.01402.471

U.S. Nuclear Regulatory Commission ATTN: Dr. Philip S. Justus Office of Nuclear Material Safety and Safeguards TWFN Mail Stop 7 C6 Washington, DC 20555

Subject: Completion of Administrative Item—Review of DOE Information Addressing Structural Deformation and Seismicity Key Technical Issue Agreement Item 3.02 (AI 01402.471.271)

Dear Dr. Justus:

Attached is AI 01402.471.271, entitled "Review of DOE Information Addressing Structural Deformation and Seismicity Key Technical Issue Agreement Item 3.02." This review provides a basis for accepting the methodology proposed by DOE to address staff concerns with pre-test predictions for the Alcove 8–Niche 3 hydrologic test. To close this agreement item, three additional information items are needed. Two of the items, (i) clarification whether pre-test predictions apply to small-plot or line release test or both, and (ii) clarification on specific test objectives of line release test, are adequate. The third is incomplete, in that there is no indication that the test plan will be completed prior to the test itself. If you have any questions, please contact Dr. David Ferrill at 210-522-6087 or me at 210-522-5183.

Sincerely,

A. Launce Mikeyre

H. Lawrence McKague Element Manager, GLGP

HLM rae

Attachment

cc:

W. Reamer D. DeMarco D. Riffle B. Meehan

J. Linehan

L. Campbell T. Essig J. Greeves K. Stable T. McCartin J. Anders J Schlueter J. Bradby S. Wastler

I. EssigW. PatK. StableinB. SagJ. AndersonCNWRJ. BradburyT. Nag

W. Patrick B. Sagar CNWRA Dirs/EMs (letter only) T. Nagy (SwRI Contracts) D. Ferrill D. Sims J Stamatakos R. Fedors

D.\GLGP Group\letters\sds\ai-07-30-2002hlm.wpd



Washington Office • Twinbrook Metro Plaza #210 12300 Twinbrook Parkway • Rockville, Maryland 20852-1606

NRC Review of DOE Documents Pertaining to Key Technical Issue Agreements

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 its 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 attachment addresses one agreement between the NRC and DOE made during the Structural Deformation and Seismicity (SDS) Technical Exchange and Management Meeting (see letter,¹ which summarized the meeting). By letter,² DOE submitted information to address SDS Agreement 3.02. The information submitted for this agreement is discussed below:

1) Structural Deformation and Seismicity Agreement 3.02

<u>Wording of the Agreement:</u> A Letter Report entitled "Transmittal of Information Addressing Key Technical Issue (KTI) Agreement Items Radionuclide Transport (RT) 3.06 and Structural Deformation and Seismicity (SDS) 3.02." This letter report is in response to a letter³ that provided results of the NRC review of Pre-Test prediction Report, which identified three additional information needs:

- 1. Provide the pre-test predictions for the Phase II test components
- 2. Provide clarification of whether the tracer transport results for the small-plot tests discussed in the Pre-Test Prediction Report, and the pre-test predictions in Attachment II to the Pre-Test Prediction Report, are the pre-test predictions for the small-plot test or the line release (fault) test, or both
- 3. Provide clarification on the specific test objectives of the line release (fault) test

<u>NRC Review:</u> In the subject letter report, the DOE responded to each of the numbered additional information needs stated above in order.

¹Schlueter, J.R "U S Nuclear Regulatory Commission/U.S. Department of Energy Technical Exchange and Management Meeting on Structural Deformation and Seismicity (October 11–12, 2000)." Letter (October 27) to S. Brocoum, DOE. Washington, DC: NRC. 2000

²Ziegler, J.D. "Transmittal of Information Addressing Key Technical Issue (KTI) Agreement Items Radionuclide Transport (RT) 3.06 and Structural Deformation and Seismicity (SDS) 3 02." Letter (June 27) to J R. Schlueter, NRC. Washington, DC: DOE. 2002.

³Reamer, C.W. "Radionuclide Transport Key Technical Issue Agreements." Letter (February 6) to S. Brocoum, DOE. Washington, DC. NRC. 2002.

- 1. DOE stated that planning for Phase II pre-test predictions is currently being finalized, and that these predictions will be available after fiscal year 2002. This additional information need remains unfulfilled because a specific delivery date of the Phase II pre-test predictions is not scheduled. We note that it is important that pre-test predictions be completed and reported prior to completion of the test itself. Given the uncertainty regarding timing of Phase II testing, the timing of fulfillment of this information need should be provided both in terms of date of delivery and relative date of delivery with respect to conducting Phase II testing.
- 2. DOE stated that tracer transport results for the small-plot tests discussed in the Pre-Test Prediction report, and the pre-test predictions in Attachment II to the Pre-Test Prediction Report, are the pre-test predictions for the small-plot test. This information fulfills the additional information need, and Item 2 can now be closed.
- 3. DOE states that "The main objectives of the line release (fault) test include quantification of large-scale (~20 m) infiltration and seepage processes in the potential repository horizon, estimation of relations between relative permeability and water potential for unsaturated flow in faults and fracture networks, and evaluation of the importance of matrix diffusion in unsaturated zone transport processes." This description fulfills the additional information need, and Item 3 can now be closed.

The DOE letter also transmitted the report "Updated Pre-Test Predictions of Tracer Transport for Alcove 8–Niche 3 Cross-Over Fault (Fault) (Phase 1)," which includes pre-test predictions for the Cross-Over Fault Test (also called the line release test or small-plot test) (Phase 1). DOE considers the information provided in the letter and the enclosed report to fulfill RT 3.06 and SDS 3.02 and the associated additional information needs, except for the pre-test predictions for Phase II test which are not yet available. Additionally, since these two agreements are identical, DOE suggests that SDS 3.02 could be closed, and the remaining information need tracked by RT 3.06. From the standpoint of commitment consolidation, closing SDS 3.02 makes some sense. However, the hydrologic tests at Alcove 8–Niche 3 provide direct measurements of movement of water through faults and fractures at a scale that can and should be tied to detailed structural observations and measurements. From this standpoint, and especially from the perspective of fracture informing tests and pre-test predictions which has been the topic of ongoing discussions, we think it important to retain SDS 3.02 as an open commitment until the remaining additional information need (Phase II pre-test predictions) has been fulfilled.

During review of the report "Updated Pre-Test Predictions of Tracer Transport for Alcove 8–Niche 3 Cross-Over Fault (Fault) (Phase 1)," Center for Nuclear Waste Regulatory Analyses (CNWRA) staff (D. Ferrill, D. Sims, R. Fedors) noted internal inconsistencies within the report, and inconsistencies between the assumptions of fracture network and water movement used in pre-test predictions (fractures not connected to fault) and the assumptions used in site scale unsaturated zone flow modeling (fully connected fault and fracture network). The inconsistencies may prominently affect conclusions pertaining to fracture and fault unsaturated zone hydrologic properties and pertaining to matrix diffusion. Furthermore, water breakthrough did not first occur in the expected location (vertically below the input location) but at the Exploratory Studies Facility bulkhead away from Niche 3 and laterally away from the expected breakthrough location, indicating a significant amount of lateral water movement {compared with 20 m [66 ft] vertical component of movement}. The bulk of the water (90 percent) was never recovered, either below the input point or elsewhere. This indicates a large component of lateral flow, the magnitude of which cannot be quantified because the whereabouts of the water is not known. This is in conflict with the assumption of vertical flow in the pre-test prediction and unsaturated zone site scale modeling. In light of CNWRA staff concerns regarding this report, and observations made by CNWRA staff (R. Fedors, C. Dinwiddie, D. Sims) and consultant (M.B. Gray) during a site visit to the Alcove 8–Niche 3 test, a thorough review of this report, led by unsaturated and saturated flow under isothermal conditions staff, should be undertaken and reported separately at a later date.

1

į,