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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: Fault Zone Deformation in Welded Tuffs at Yucca Mountain, Nevada
(IM 01402.471.140)

Dear Dr. Justus:

In your letter of October 16, 2001, you accepted the subject deliverable on fault zone deformation, but noted that you and other NRC staff had several comments that needed to be addressed before the manuscript could be placed in the public document room or submitted for publication in a peer-reviewed journal. No time-table was provided for the revisions, and in conversations with you we agreed that the revisions would be completed within the constraints of scheduled fiscal year 2002 deliverables. This letter is to inform you of the significant progress made toward resolving those comments and the planned schedule for completion of the revisions.

To date, we have addressed nearly all the comments provided in your letter. The one set of comments that we are still working to resolve are related to observations and conclusions developed from analysis of calcite twins in the secondary minerals. As you know, we have had several lengthy discussions with interested NRC staff concerning the validity of the calcite twin thickness measurements, and the interpretation that those twin-thicknesses suggest elevated deformation temperatures. Thus far we have not convinced some at NRC of the validity of our measurements and our conclusions.

To fully address NRC staff concerns we plan the following:

1. Reacquire the consulting services of Dr. Mark Evans at the University of Pittsburgh. Dr. Evans will perform three tasks for us:
 - (a) Develop a full description of his measurement techniques that includes a clear and fully supported definition of "thick" and "thin" twins.
 - (b) Verify twin measurements and photograph many of the twins on the U-stage microscope to illustrate differences between thin and thick twins.
 - (c) Host a site visit at his laboratory at the University of Pittsburgh, with Dr. Gray, you, and others from NRC to view the samples and demonstrate the procedures he used to assess twin width and intensity. This will support the



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conclusion that secondary calcite from Type B fault zones at Yucca Mountain contain thick twins, in support of observations and conclusions presented in the manuscript.

2. Revise the manuscript to codify the bases and fully describe uncertainties of our interpretations, and to clearly reflect those uncertainties in the paper's conclusions.

In addition, Dr. David Ferrill is preparing a separate manuscript on the general topic of calcite deformation twins based on a worldwide data set of calcite twin measurements. Co-authors of the manuscript will include nearly all the recognized calcite twin experts in the world, including Drs. Groshong, Onasch, Burkhard, Evans, and Morris. That manuscript will also address the issue of thin and thick twins and how twin width relates to deformation temperature.

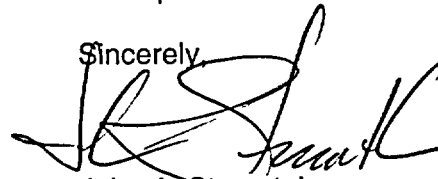
Finally, because the issue may affect many subissues across the program, we will seek additional review comments on the revised manuscript from staff members from several KTIs, including IA, ENFE, and USFIC. Although this may add some time to the review process, it will secure a broad and integrated technical review.

We are taking these extra measures to ensure that the scientific basis for our work fully and unequivocally supports our conclusions. This is especially important given the possible application of the calcite-twin results to the larger and more contentious issue of potential hydrothermal upwelling of reactive fluids at Yucca Mountain and the overall thermal-chronologic evolution of the Yucca Mountain region.

We anticipate submitting a revised version of the fault-zone deformation manuscript (IM 01402.471.140) to you early in the first quarter of fiscal year 2003. The immediate need to meet commitments for completion of scheduled milestones plus unscheduled reviews of recent DOE submittals precludes a more rapid completion of these revisions.

If you feel that revision of the fault zone deformation manuscript now has a higher priority than currently scheduled fiscal year 2002 milestones, then we would be open to discussion with you on how to readjust priorities and the current deliverable schedule accordingly. We appreciate your continued interest in the fault zone deformation manuscript and we look forward to working with you and others at NRC toward successful publication of this manuscript.

Sincerely,



John A. Stamatakis
Principal Investigator

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Attachment

cc: J. Linehan	D. DeMarco	J. Greeves	N. Coleman	D. Ferrill
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