

September 19, 2002

Dr. H. Lawrence McKague
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Center for Nuclear Waste Regulatory Analyses
6220 Culebra Road
San Antonio, Texas 78228-5166

SUBJECT: INTERMEDIATE MILESTONE 01402.471.230, "FAULT DISPLACEMENT GRADIENTS AT YUCCA MOUNTAIN, NEVADA," JOURNAL ARTICLE

The subject deliverable, journal article by A. P. Morris, D.A. Ferrill, D.W. Sims, N. Franklin, and D.J. Waiting, was transmitted to me by your letter dated August 7, 2002. This deliverable fulfills the intent of the Center FY '02 Operations Plans commitment 471.230, Revision 16, change 1, page 2-11, which was to evaluate alternative interpretations of fault and fracture data regarding repository performance and preclosure safety, especially with regard to possible expanded repository areas. As reflected in Program Manager's Periodic Report FY2002-11, the title of the deliverable was changed to the current one, and the format changed from a letter report to a journal article. Submittal was five days before the due date.

This draft journal article was reviewed for programmatic content by Bill Reamer, Janet Schlueter, Larry Campbell, and myself. I have assimilated the comments and find the deliverable acceptable. I consider that the fault displacement gradient method of analysis invented by the Structural Deformation Seismicity Center team (and previously published in a peer-reviewed journal) is demonstrated in this deliverable to be a useful tool to evaluate the orientation and intensity of small faults and fractures associated with large normal faults. The authors have applied it to fault blocks in the Yucca Mountain vicinity and make defensible findings for variability of small scale faults and fractures from one fault block to another. I consider the method and its application to be technically sound.

However, the deliverable is not approved for publication for programmatic reasons. The Department of Energy (DOE) has not documented any decision to go forward with expansion areas in fault blocks surrounding the current repository block. It is premature to assume DOE may include any expansion areas in its repository design in a license application, no less the expansion areas you have transferred from DOE's report to your figures 1b, 5, and A1. The deliverable would do well to avoid the issue of whether or not non-characterized areas might be included in a DOE license application.

There are just four composite statements that go beyond the technical analysis results:

- (1) fault and fracture characteristics in expansion fault blocks have not been studied in detail (p.1, para.1; p.4, line 3);
- (2) DOE is considering expanding the repository area to reduce thermal load (p.3, Para.1);
- (3) the potential repository expansion fault blocks require further analysis of their fault and fracture populations (p.4, last sentence; p.18, para.2);

(4) it is necessary to investigate the possibility that fault displacement gradients...caused variability in orientation and intensity of small-scale faulting and fracturing in fault blocks (p.18, para.2).

These statements are independent of the results of this study, but they get into programmatic speculative issues and can imply that DOE is supposed to do certain characterization work. For example, future expansion areas may not be the ones shown in current DOE documents; the function of expansion areas may change, therefore, the goals of characterization, may differ from your statement. The reference to expansion areas implies that DOE is including, or might include, non-characterized areas in its design in a license application. However, DOE's decision on expansion areas is not documented, and appears to be evolving. At the time an article is published, the facts about expansion areas might be different from that indicated.

I recommend that you avoid these issues, and resubmit the results of your work for publication. If the issues are avoided, programmatic objections to the publication of the deliverable would be removed. I believe, as do the reviewers, that the deliverable could be published on its own technical merits.

The deliverable will not be placed in the Public Document Room (PDR). It can serve its intended purpose, as is. There is no requirement to revise this deliverable. Its publication is not required. Should you revise the manuscript and submit it for publication, which NRC encourages, the NRC-approved manuscript would be placed in the PDR. DOE could then gain cognizance of the results of your work, whether or not the revised manuscript is actually published in a journal. After reviewing this critique and the mark-up (sent separately), please call me to discuss your intention to get the results of the analyses of fault displacement gradients in Yucca Mountain faults into the PDR.

Sincerely,
/RA/

Philip S. Justus
Program Element Manager
Geology/Geophysics Program Element

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Philip S. Justus
Program Element Manager
Geology/Geophysics Program Element

CNWRA 2002
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