Department of Energy
Office of Civilian Radioactive Waste Management
Yucca Mountain Site Characterization Office
P.O. Box 364629
North Las Vegas, NV 89036-8629

QA: N/A

JAN 24 2002

JAN 25 2002

Dr. Jared L. Cohon
Chairman
Nuclear Waste Technical Review Board
2300 Clarendon Blvd.
Suite 1300
Arlington, VA 22201-3367

Dear Dr. Cohon:

On July 24, 1998, the Nuclear Waste Technical Review Board (the Board) provided the Acting Director, Office of Civilian Radioactive Waste Management with its evaluation of and conclusions about a set of material provided to it by the State of Nevada Attorney General's office. The set of material was presented as new evidence regarding the possible future upwelling of water into the proposed nuclear waste repository at Yucca Mountain. The Board concluded that the material it reviewed did not significantly affect the conclusions of the 1992 National Academy of Sciences (NAS) report on similar issues. The NAS considered such a scenario to be not credible. The U.S. Department of Energy (DOE) agreed with that conclusion then and now. The Board also suggested that DOE consider conducting some additional analyses to determine the ages of fluid inclusions in mineral deposits at Yucca Mountain.

As the Board suggested, the DOE funded a joint research program coordinated by Dr. Jean Cline, University of Nevada, Las Vegas (UNLV) in which scientists from the State of Nevada, the U.S. Geological Survey (USGS) and UNLV conducted detailed analyses of the fluid inclusions found in mineral deposits. Participants met on a regular basis between March 1999 and March 2001 to establish a common methodology for sample collection and handling and share the results of their investigations. The DOE appreciates the Board's ongoing interest in the fluid inclusions work, as evidenced by several invitations to Dr. Jean Cline and members of the working group of scientists, to present their findings to the Board. The Board staff and individual Board members also participated in the quarterly meetings and other fora where the work was presented.

Dr. Cline has given the DOE a two-part, draft report entitled "Thermochronological Evolution of Calcite Formation at the Potential Yucca Mountain Repository Site, Nevada: Part 1, Secondary Mineral Paragenesis and Geochemistry" (Wilson and Cline) and "Thermochronological Evolution of Calcite Formation at the Potential Yucca Mountain Repository Site, Nevada: Part 2, Fluid Inclusion Analyses and U-Pb Dating" (Wilson, Cline, and Amelin). The report was issued in draft form because the Harry Reid Center (HRC) acknowledges that there are some outstanding issues regarding the database generated by the scientists. Recent discussions with the HRC indicate these issues are nearly resolved and it is expected that the database will be submitted to the DOE Technical Data Management System in the near future.

The purpose of the Cline study was to independently examine the secondary mineral deposits and especially the fluid inclusions within these secondary minerals, and interpret the observations regarding the origin of the fluid inclusions and secondary mineralization. A reading of the report indicates the work provides independent confirmation of work on secondary minerals by DOE scientists. For example:

Paces et al state in the abstract of the 2001 USGS report "Ages and Origins of Calcite and Opal in the Exploratory Studies Facility Tunnel, Yucca Mountain, Nevada": *The physical and isotopic data from calcite and opal indicate they formed from solutions of meteoric origin percolating through a limited network of connected fracture pathways in the unsaturated zone rather than by inundation from ascending groundwater originating in the saturated zone.*

Wilson, Cline, and Amelin state in the abstract for Part 2 of their report: *Results from this study are consistent with a model of descending meteoric water that infiltrated the cooling tuff sequence, became heated, and precipitated secondary minerals within the vadose zone.* And further, *This study demonstrates that the hypothesis of geologically recent upwelling hydrothermal fluids is untenable and should not disqualify the Yucca Mountain as a potential nuclear waste storage site.*

The position on this issue by scientists representing the State of Nevada seems unchanged. In a pre-publication excerpt from the "Scientific status of the lingering 'upwelling water' controversy in light of the joint UNLV/USGS/State of Nevada research project" by Jerzy S. Szymanski and Dr.Yuri V. Dublyansky, May 2001, pp. 19, *"The proposed conceptual model implies that vadose zone is occasionally subjected to an upward flux of heat and gas-charged fluid, in addition to being subjected to a small flux of infiltrating rainwater."*

The data collected by both DOE and UNLV researchers confirm that the conceptual model of descending percolation is correct. The DOE further concludes that the "upwelling waters" or "seismic pumping" hypotheses for the origin of secondary mineralization at the Yucca Mountain site have been adequately addressed and may be discounted. The DOE is continuing to examine secondary minerals in conjunction with studies involving infiltration, flux rates, thermal effects, waste package geochemistry, paleohydrology and for other studies. Specifically, DOE does have ongoing studies to investigate the thermal history of the younger inclusions. The DOE and our scientists remain open-minded and interested in the characterization of the geology and hydrology of the proposed Yucca Mountain site, and how it might perform as a repository for nuclear waste.

Sincerely,

J. Russell Dyer
Project Manager

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cc:
CMS Coordinator, BSC, Las Vegas, NV
W. J. Boyle, DOE/YMSCO, Las Vegas, NV
Stephan Brocoum, DOE/YMSCO, Las Vegas, NV
D. H. Coleman, DOE/YMSCO, Las Vegas, NV
R. L. Craun, DOE/YMSCO, Las Vegas, NV
J. R. Dyer, DOE/YMSCO, Las Vegas, NV
A. V. Gil, DOE/YMSCO, Las Vegas, NV
D. G. Horton, DOE/YMSCO, Las Vegas, NV
V. F. Iorii, DOE/YMSCO, Las Vegas, NV
S. P. Mellington, DOE/YMSCO, Las Vegas, NV
C. M. Newbury, DOE/YMSCO, Las Vegas, NV
D. R. Williams, DOE/YMSCO, Las Vegas, NV
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