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January 5, 2006

Mr. Dave Snyder
Dr. Kevin Lesko
Dr. Bill Roggenthen

Dear Dave, Kevin, and Bill:

RE: Letter of Interest to the South Dakota Science and Technology Authority (SDSTA)

***Title*: Coupled Mechanical-Hydrological Behavior of Fractured, Rock Mass**

Participants

Herb Wang, University of Wisconsin –Madison
Steve Blair and Steve Carlson, Lawrence Livermore National Laboratory
Steve Martel, University of Hawaii
Tomochika Tokunaga, University of Tokyo

Proposed Program

The scientific goal is to test the hypothesis that hydrologic flow in fractured, rock mass can be predicted from the stress field. This hypothesis can be tested over a large range of time scales (days to decades) and spatial scales (centimeters to kilometers) in the unique environment of the deep underground laboratory at Homestake. Changes in the stress field will occur as a result of dewatering and construction of large physics chambers, or they can be produced by active methods ranging from overcoring to meter-scale excavations. This proposed activity will be closely coordinated with a program of direct stress measurements and geophysical imaging. A major emphasis will be to relate changes in stress and fluid flow to their influence on microbial life. This proposed research can be integrated into a broader program of coupled geomechanics and geohydrology processes.

The research program will consist of the following tasks in sequential order: (1) Compilation and interpretation of the existing Homestake mining database, (2) Baseline characterization of fracture occurrence, orientation, and apertures as soon as the mine is rehabilitated and opened for access, (3) Acoustic emission, deformation, and fracture flow monitoring, (4) Active methods for inducing stress changes.

Several of the methodologies that will be employed have been used at other underground research laboratories. For example, the acoustic monitoring program will utilize techniques developed previously at the URL in Canada. The fracture flow monitoring will incorporate the multiple collector sheets utilized at Stripa. Deformations will be measured by borehole tiltmeters and extensometers.

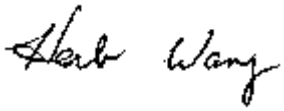
Space Requirement

(1) Characterization of fractures and installation of deformation sensors can use as much run-of-mine access as cost and safety considerations permit. (2) A data acquisition station for acoustic emission and deformation monitoring will be established at the 4850 level.

Timeline

2006	Examine existing Homestake database
2007-2008	Characterize fractures
2007-	Monitor dewatering and other construction activities
2009-	Induce stress changes at different spatial scales

Sincerely,



Herb Wang
Professor of Geophysics