

- Deep Coupled Processes Laboratory

Letter of Interest for Research at Homestake

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Title: **Deep Coupled Processes Laboratory**

Investigator: Tommy J. Phelps (tentative),

Collaborators: Tom Kieft, NMT; J.Wang; M. Conrad; TC Hazen; TC Onstott; SM Pffner; R. Bodnar, etc..

Science Goals: The goal of this multidisciplinary project is to characterize coupled-processes that affect critical scales of environmental Bio-Geo-Hydro-Chem- and Engineering-Sciences, including in situ monitoring and large block tracer studies. Characterize coupled processes under ambient and manipulated conditions. Investigating the chemical fate and transport including dissolution/precipitation and modification of mechanical and transport parameters during multiphase flow and transport will be critical in understanding deep coupled processes.

Research objectives: The objectives will be to examine gas, liquid, solid, conservative tracers and bio-transport issues related to a broad arena of science: Energy resource recovery, CO₂ sequestration, Waste isolation, In situ mining, Mineralization and ore body formation. Conservative tracer analysis coupled with geophysics will be critical for quantifying chem.-bio-geo-heterogeneity.

Methods: Drilling and coring multiple holes for block-type experiments to assess natural and manipulated large-scale coupled process experiments. Large numbers of discrete sampling points will be complemented by numerous highly instrumented well-bore assessing P, T, Chem, Bio, Geo components and integrated across a large 3-D scale.

Integration with E&O: Infrastructure Requirements and Impact on Other Users: Lower deep lab infrastructure is required but the impact on others would be slight as it would begin at the onset of deeper lab activities and be well established long before deep physics studies were initiated. After initiation of deep physics experiments drilling activities would be coordinated to occur during 'down' times such that co-utilization would be preplanned and readily implemented with considerable sharing of deep infrastructural facilities.

Readiness for Deployment of the Technology: The technology is well developed and teams of investigators and well experienced teams are available. Funding and site preparation are lacking and will likely be unavailable until well after 2012.

Readiness of Effort and Funding: Likely not worthy of consideration until well after 2012.

Budget: \$800k/yr for at least 5 years and can only begin after a deep lab is available

\$3my/yr for at least 4 years for coring and installation of 10's of >200m onstrumented deep boreholes.

ES&H Issues: Requires a deep lab, extensive deep infrastructure and safety needs to be in place with extensive rigorous and redundant safety and education. This proposed project would follow on deep subsurface activities and the ES&H issues will be established by that point. Stepwise growth of the ES&H will result in well developed procedures at the initiation of tis large multidisciplinary program.