UNIVERSITY OF UTAH RESEARCH INSTITUTE

UURI

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August 10, 1979

Dean Pilkington
Amax Exploration Co.
4704 Harlan Street
Denver, CO 80212

Dear Dean,

During our recent conversation in Salt Lake City, we briefly discussed the possibility of a cooperative multielement geochemical study of drill hole samples from the McCoy, Nevada, geothermal field. Samples from the shallow thermal gradient holes are not included in your current DOE agreement under the Industry Coupled Case Studies Program. I would like to explore this possibility further with you and acquaint you with our capabilities and experience in the geochemistry of geothermal systems.

The Earth Science Laboratory was organized in 1977 to provide management assistance to DOE on several of their programs and to develop new and improved methods for use in geothermal exploration. At that time, it was apparent that multielement geochemical studies of high temperature geothermal systems were lacking in spite of the widespread use of geochemical zoning models by the mineral exploration industry. Consequently we set up a geochemical laboratory and began a geochemical characterization of solids from several high temperature systems in the western U. S. We now have broad practical experience in the handling of multielement analysis of solid samples. An ARL Inductively Coupled Plasma Spectrometer, supplemented by an IL Atomic Absorption Spectrophotometer, gold film mercury detector, and conventional wet chemical techniques provide major, minor, and trace element determinations of the 37 elements routinely used in our multielement studies. These elements are Na, K, Ca, Mg, Fe, Al, Si, Ti, P, Sr, Ba, V, Cr, Mn, Co, Ni, Cu, Mo, Pb, Zn, Cd, Ag, Au, As, Sb, Bi, Te, Sm, W, Li, Be, B, Zr, La, Ce, Th, and Hg.

A significant result of our program has been the recognition of geochemical zoning at various scales in geothermal systems. For example multielement geochemical zoning in the Roosevelt Hot Springs geothermal field delineates the shallow, productive high temperature portion of the system as well as the locations of high temperature fluid entries in deep drill holes (Bamford, 1978; Bamford and others: in preparation). Geochemical zoning models of The Geysers, Roosevelt Hot Springs, and Cove Fort/Sulphurdale geothermal systems will be published shortly.

In our work with you under the Industry Coupled Program at McCoy, Nevada, it has become apparent that multi-element geochemical studies of drill chip samples might make a significant contribution. Ongoing geologic and geophysical studies by the Earth Science Laboratory, as part of its Industry Coupled Case Study Program, would provide complimentary data necessary for the interpretation of ESL geochemical data. We are funded to a limited extent by DOE to provide needed data bases to complete case studies, and could use these funds for the proposed work. We would like to know if it would be possible to obtain the samples we need for such a study?

In general, approximately 25 grams of sample per 10 feet of drill hole are needed for a complete chemical analysis. Prior to analysis the individual drill chip samples are combined into 100-foot composites, to minimize both sample bias and the number of samples needed for analysis, and a heavy mineral fraction (>3.3 gram) is separated. Although the geochemical signatures associated with low salinity fluids are weak compared to those associated with ore deposits, a substantial enhancement of these signatures can be obtained through analysis of the heavy mineral fraction.

We would, of course, need to work closely with you on the proposed study. Data generated during this study would be released at such time as specified for data release under Phase III of your program designated in contract DE-AC08-79ET27010.

I believe that the geochemical study outlined here would be mutually beneficial to AMAX, to the Earth Science Laboratory,and to the entire geothermal community. If there is any additional information you need, please do not hesitate to contact me.

Sincerely,

Joe

Joseph Moore
Geologist

JM:ls