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**MINERALS EXPLORATION AND ENVIRONMENTAL GEOCHEMISTRY**
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## GEOTHERMAL EXPLORATION

***This brochure describes MEG's areas of technical expertise in mineral exploration and applications to geothermal resource evaluation. MEG has developed leading technologies in biogeochemistry, mercury, and radon soil gas, which are described in a geothermal context..***

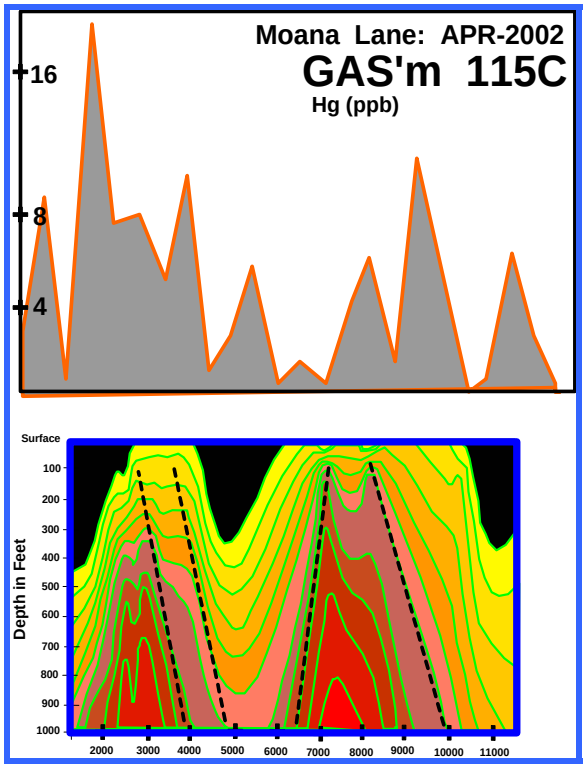
### *OVERVIEW*

MEG is best known for its biogeochemical services. This work has provided several published mineral and water exploration case histories that have become the foundation for several widely attended short courses on the application of biogeochemistry in the natural resources industries.

MEG is also known for soil gas collection technology. Its proprietary GAS'm and GAS'r techniques have been used for precious, base metal, and uranium exploration, and more recently, several geothermal resource and environmental surveys.

### *LATE DEVELOPMENTS*

The need for alternative energy resources is driving US markets toward the development of geothermal resources. MEG is refocusing its leading technologies in biogeochemistry and soil gases as tools for new geothermal discoveries. MEG's Moana Lane geothermal case history demonstrates the use of mercury soil gas, with a capability of defining hot water plumes as they approach the surface.




*BELOW: An E-W cross-section of Moana Geothermal Area (Reno, NV) along Moana Lane (Flynn & Garside, 2001). ABOVE: Mercury soil gas profile from soils collected in 2002 and thermally desorbed at 115C. Note the close spatially correlation between the thermal plumes and the mercury profiles.*

More lately, work in Lander County, north-central Nevada, has demonstrated that biogeochemical data can be used to locate areas of relatively high enthalpy. More particularly, ratios of common major elements highlight the best areas for drill testing.

The Reese River project has moderate sagebrush coverage, but enough to collect samples every 100 feet. The tissue was macerated and analyzed for 45 elements by AR/ICP/MS. Plots of elements related to thermal alteration (As, B, Hg, Li, Sb) identify prospective areas of relatively high enthalpy.

Radiometric data, from three-channel scintillometry, also delineate prospective areas.

The advantages of soil gas mercury and biogeochemistry are the ability to map subsurface structures clearly, without offset, and with the additional ability to identify relatively hot areas for drill testing. Both methods use media with long term exposure to the effects of the thermal system, and are not as susceptible to diurnal overprinting.

### *Soil Gas Geochemistry*

Mercury soil gas methods have been tried and proven over geothermal areas. The response is clear and decisive. Structures are defined and thermal plumes related to hanging wall and foot wall features can be identified.

Radon gas methods have not been tried, but scintillometry data indicate that radioactive decay should relate to radon effusivity. See details in the Soil Gas Brochure.

Both methods use clays in soil as gas capture minerals. These clays have been resident for thousands of years. Unlike buried collectors or temperature probes, the chemical signature of the soils is imprinted with centuries of exposure to the thermal system. The resulting patterns should be in-place and robust.

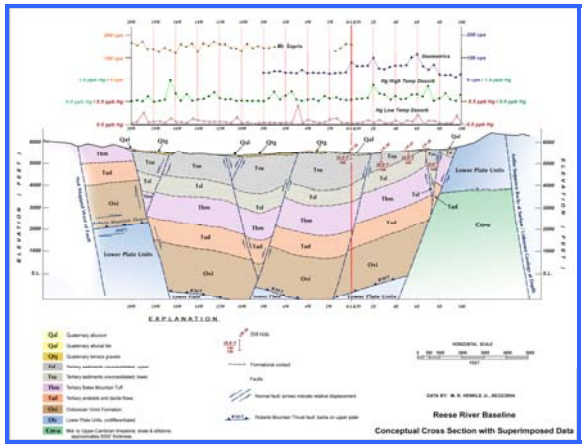
### *Mercury Soil Gas Geochemistry*

GAS'm Prep & Analysis ……. US $16.90
Subsequent Desorptions (each) US $ 7.90

### *Radon Soil Gas Geochemistry*

GAS'r Analysis …… US $19.00

BROCHURE 2010




*Cross-section through the basin at the Reese River Project, Lander County, Nevada. Mercury soil gas profiles are anomalous over structures that bring hot water closer to the surface on the east side of the property. Radiometric data spatially correlates with the mercury data.*

### *Biogeochemistry*

Trace metal concentrations in plant tissues reveal subsurface ground water chemistry. Thermal ground waters significantly increase the availability of metals in solution that ultimately are absorbed by plant roots. Biogeochemical profiles of metal concentration reveal thermally active and inactive structure, with “shoulders” revealing hanging-wall and foot-wall features. Most multi-element analyses report upwards of 50 elements, including typically volatile and mobile geothermal pathfinders like As, B, Cs, Hg, REE, Li, and Sb. These and others can be plotted singularly to identify zonation that indicates the geothermal feature. Another approach is to plot, metal ratios, which more directly indicate relative thermal anomalies. For instance, it was observed at the Reese River project that ratios of K-Mg, like geothermometry of thermal water, tend to highlight areas of anomalous enthalpy, rather than simple alteration.

## *SURVEY COSTS*

Biogeochemical, mercury, and radon soil gas geochemistry provides your geothermal exploration programs with valuable targeting information. MEG's proprietary methods are designed to detect deep bedrock and ground water sources. Rigorous biogeochemical, soil collection protocols require experienced field personnel. MEG has the professionals that will assure your surveys are correct and smartly executed.

**See the Biogeochemical Brochure for Preparation Costs**
**See the Soil Gas Brochure for Preparation & Analytical Details**

### *Field Costs*

| | |
|---|---|
| Crew …….. | US $ 295/day |
| Supervisor ……. | US $ 470/day |
| Vehicle …….. | US $ 0.70/mile |
| Expenses …… | Cost + 10% |

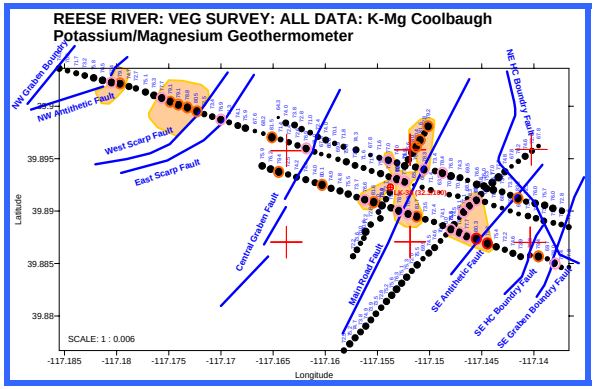
### *Consulting Services*

| | |
|---|---|
| Office ..... | US $105 /hour |
| Field ..... | US $1050 /day |

## *ANALYTICAL ASSOCIATES*

MEG’s associate laboratories have analytical capabilities that stand up well to continual quality assurance monitoring. In addition, these labs have demonstrated an ability to do well with exotic media like vegetation, soils, soil gases, and trace metals in water.

All of the associate laboratories provide multi-element packages, commonly reporting from 10 to 60 elements for costs under US $25. With improved understanding and recognition of metal zonation around natural and anthropogenic deposits, primary and secondary element data are of increasing importance in determining the location and character of the geochemical target.




*Plan view of the Reese River biogeochemical survey with K-Mg ratio values plotted.Anomalous areas are highlighted in orange, which tend to be on the hanging-wall side of indicated faults (blue). Prior test drilling (ca 1980’s) just west of the Main Road Fault hit bottom temperatures of 50C.*

## *OTHER SERVICES*

SAMPLE PREPARATION:
Rock, Soil, Sediment, Vegetation
SURVEY & COLLECTION
GEOCHEMICAL INTERPRETATION
QUALITY ASSURANCE PROGRAMS
STANDARD REFERENCE MATERIALS

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