McCOY GEOPHYSICS

Preliminary Report

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Heatflow, gravity, magnetics and self-potential surveys were performed over the McCoy area. In addition a passive seismic survey was supplemented by a refraction experiment utilizing 3 blasts. The results of these studies are shown in schematic form on the accompanying maps and overlays, and may be directly compared to the generalized geologic base map (Figure 1). A magnetotelluric survey is still to be run, and an electromagnetic survey operated by LBL has not yet been reported on.

Heatflow

The heatflow survey was obtained from 46 wells of which 38 were drilled by AMAX (Figure 1A). Holes were drilled to 40 or 50 meters, but some available wells (at McCoy Mine and Hole in the Wall Well) are 70 and 150m, respectively. Heatflows were computed from thermal gradients and measured and estimated conductivities of cuttings.

The majority of the wells fall on the McCoy property and extend in a NS zone 10km wide between the New Pass range and Augusta Mts. Because the high heatflow occurs within this same zone, the thermal extent of the anomaly is clearly defined only on the east, where wells drilled into the border region of adjacent Antelope Valley exhibit low thermal gradients.

Within the thermal area, high heatflow occurs at the McCoy Mine (14hfu) and 3km SE of Hole in the Wall Well No. 2 (18hfu). Both of these anomalies fall on a major lineament expressed by Hole in the Wall wash, and discussed below in the section on self-potential. An extension of the thermal anomaly to the north is indicated by a third high (11hfu), 4km north of McCoy Mine. The highest heatflow was obtained 4km north of the end of the Edwards Creek Valley, where 23hfu were measured. This high coincides with the intersection of two magnetic low trends, the most prominent SP dipolar anomaly, and a zone of P-wave delay.

Magnetics

The McCoy aeromagnetic map shows the intersection of major fault trends (Figure 3). A narrow magnetic low extends from the Edwards Creek Valley into the Antelope Valley (from A to B). It appears to be a structural low separating the two magnetic highs C and D. Magnetic high C is probably related to the Augusta Mountains horst block. Anomaly D occurs over the New Pass Range horst. A second series of magnetic lows extends north-northwesterly into Dixie Valley (from A to E). The strike direction of the faults bounding these lows suggests they are right-lateral faults caused by east/west extension. Anomaly F occurs over intrusive rocks of the Humboldt lopolith. The magnetic low, G, in the intersection zone may be caused by hydrothermal alteration.

Gravity

The complete Bouguer gravity map of the McCoy prospect shows the intersection of two gravity lows (Figure 2A). The Edwards Creek Valley graben occupies the gravity low along the center edge of the map (A). A second graben-fill structure causes the gravity low in the Antelope Valley (B). The fault zone along the west margin of the Edwards Creek Valley appears to continue to the northeast, forming a narrow structural and gravity low which separates the south end of the Augusta Mountains from the New Pass Range (C). A second narrow structural low extends in a northwesterly direction from the Edwards Creek Valley to Dixie Valley (A to D to E). Faults along this low generally form an orthogonal set with faults along the west side of the Edwards Creek graben. This relationship suggests that faults having northwesterly strike are probably right-lateral and that they formed in response to north/south compression.

Seismic studies

MicroGeophysics Corporation conducted a passive seismic survey during 31 days in June and July 1979. Twenty-two stations were occupied during the survey.

Microearthquake epicenters based on a linear increase of velocity with depth, are plotted in Figure 3. Of 36 microearthquakes recorded, 30 could be located, but not all fall on our map. In the map area all events of magnitudes greater than -0.4 should have been recorded. Due to the limited number of events, a contour map of strain release is not warranted in this report. Clusters of three events occurred in the vicinity of the McCoy Mine; in an area 5km south of Hole in the Wall; and near Horseshoe Well south of the McCoy property. Faults, determined from fault-plane analysis are shown on the map, but are poorly controlled, and are not in good agreement with mapped faults.

The Poisson's ratio map (Figure 3A) shows several areas in which the ratio exceeds 0.35. Those on the east and south appear to be due to sedimentary fill in the basins. The high occurring to the west of the McCoy Mine in the northern high heatflow area is likely due to high fracture permeability in a zone in which faulting is prevalent. At this time there is no evident explanation of the high ratios to the north and west. The zone of low Poisson's ratio in the center of the map indicates an area of low fracturing or anomalously low P-wave velocity, or both.

A P-wave delay study, based on arrivals from 9 teleseisms was reinforced with information from refraction measurements derived from 3 blasts in local mines. The principal results of this work are highlighted in Figure 3B. The blue zones of seismic advance appear to correspond to zones of outcrop, except that extending parallel to the thermal anomaly, which may express velocity enhancement due to silicification. The shallow delay in the central area was determined from the refraction survey and appears to result from a thickening of caldera fill. The P-wave delays on the north and west were not confirmed by refraction information and have no present interpretation. That on the southeast, however, correlates with the highest heatflow and largest self-potential anomaly. It reveals a mass of low-velocity material "somewhere near the surface". This area is to be given particular scrutiny during the forthcoming MT survey.

Self-potential survey

MicroGeophysics Corporation ran a self-potential survey along 6 1/2 EW lines and 4 NS tie lines. The former followed generally every other section line. The results were later examined by R. Corwin, whose comments are incorporated in this discussion.

In the map of Figure 4, only salient features are illustrated. Of greatest importance is the negative anomaly that roughly corresponds to the heatflow anomaly. This feature can possibly be an example of the classic thermoelectric anomaly, in which case the amplitudes (90mv at the south end, and 50mv at the north) would translate to 180°C and 100°C, near surface, respectively, and higher temperatures at depth. An alternative explanation that would produce the necessary coupling coefficient boundaries would be a zone of hot water flashing to steam, capped by a silicified layer.

Within the broad negative, several smaller anomalies appear. The negative at the McCoy Mine may be due to mineralization in addition to a heatflow (14hfu) effect. The dipole to the west (Hole in the Wall Well, No. 2) marks a boundary over which heatflow of 18hfu was measured. At the south end, the highest measured heatflow (22hfu) occurs at another SP boundary (mapped as a fault separating Triassic sediments from Tertiary volcanics. The extension of the negative eastward, might be due to the presence of graphitic sediments of Western facies rocks in that vicinity.

A major regional feature seems to express itself across the McCoy area as a transition from positive on the south to negative on the north; i.e., a very broad dipolar trend having its axis along Hole in the Wall wash. This major drainage corresponds to a structural lineament (visible on Landsat photos) that extends WNW through Hyder Hot Springs and Seven Devils Hot Springs in Dixie Valley.

Of the localized positive features in the western half of the map, only that farthest west can be explained at this time. It occurs over a mineralized zone and is likely related to the oxidation/reduction process in groundwater.

Note

The geophysical information summarized above may be compared with a report by H. D. Pilkington (1979), entitled "Geology of the McCoy Area, Nevada". Sections of this report on gravity and magnetics were written by Fred Berkman; the remaining sections were prepared by Arthur L. Lange. Contractors' reports on which the discussions are based are the following:

MicroGeophysics Corporation

McCoy, Nevada Microearthquake Survey. 8 October 1979.

McCoy, Nevada, Gravity Survey. 1 January 1980

Self-potential Survey, McCoy, Nevada. 15 June 1979.