BACA PROJECT

DATA AND REPORTS

GEOLOGY

No.	Transfer Date	Release Date	Title
1.	B	B	Hydrothermal Geology of the Valles Caldera, New Mexico by R.F. Dondanville - 1971.
2.	B	B	Airborne Infrared Geothermal Exploration--Valles Caldera, New Mexico Earth Resources Operations, North American Rockwell Corp.-1972.
3.	B	B	Electrical Resistivity Survey in Valles Caldera, New Mexico by Group Seven, Inc. - 1972.
4.	B	B	Additional Data--Electrical Resistivity Survey in the Valles Caldera, New Mexico by Group Seven, Inc. - 1972.
5.	B	B	Reconnaissance Resistivity Survey Baca Property, McPhar - 1973.
6.	B	B	Supplemental Report--Reconnaissance Resistivity and Schlumberger Depth Sounding Surveys Baca Property - McPhar - 1973.
7.	B	B	Quantitative Gravity Interpretation Valles Caldera Area, New Mexico by R.L. Segar - 1974.
8.	B	B	Mercury Soil Gas Survey Baca Prospect by Allied Geophysics Inc. - 1974.
9.	A	A	Mercury analysis - 1974 gradient holes.
10.	B	B	Geothermal Geology of the Redondo Creek Area Baca Location by T.R. Slodowski - 1976.
11.	B	B	Magnetotelluric--Telluric Profile Survey, Valles Caldera Prospect by Geonomics - 1976 as reprocessed by QEB Inc. - 1978.
12.	B	B	Geological Resume of the Valles Caldera by T.R. Slodowski - 1977.

GEOTHERMAL GEOLOGY OF THE REDONDO CREEK AREA

BACA LOCATION, NEW MEXICO

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FIGURES

The two main prerequisites for success in developing a geothermal field are: sufficiently high temperatures and permeable reservoir rocks. Success in the Baca project, to date, has been marginal because of the lack of sufficient primary interstitial porosity and permeability and the necessity to encounter fracture porosity and permeability.

TEMPERATURE

Temperature has been a problem in only one well, Baca 5, which has a large temperature reversal. Reference to Figures 4-6 (400°F, 450°F, and 500°F isothermal maps) shows the isothermal surfaces to dip steeply toward and roughly parallel the northwest slope of Redondo Peak. This is probably caused by most of the large amount of rainfall and snow melt on this slope infiltrating deeply into the subsurface instead of being carried off in surface streams. The reason for the infiltration is probably the large vertical movement which occurred along several large faults in this slope, causing intense fracturing (as evidenced by the numerous rock glaciers which are almost entirely restricted to this slope) which traps the water before it can become runoff. The temperature reversal at Baca 5 may be more extensive than shown and may extend further to the south and to the northeast (where the gradient has to again become normal before reaching Baca 4. (See Fig. 3).

As the maps show, the highest temperatures are encountered along Redondo Border with a lobe extending east and southeast of B-11 and B-15. This area undoubtedly extends west and northwest of the Redondo Creek portion of Redondo Border towards Sulfur Springs and Alamo Canyon.

STRUCTURE

The structure map on the base of the Bandelier tuff (Fig. 7) and the structure section through the wells on the west side of Redondo Creek (Fig. 2) suggest that the high temperature area may be controlled by both stratigraphy and structure. B-10, B-6, B-15 and B-11 encountered Tertiary sands beneath the Paliza Canyon andesite. These sands have sufficient porosities and permeabilities to serve as aquifers and permit deeper hot water to the west to convect up-dip towards Redondo Border. (These sands may be absent on the east side of Redondo Creek as suggested by their absence in B-13). Fairly closely spaced cross-faulting and associated fractures in the area of the above mentioned wells could also allow convection of hotter deeper waters in this area. The structurally high areas, although somewhat complicated by faulting, coincide rather well with the isothermal surface highs. The structural high is readily apparent on the structure section (Fig. 2), where B-15 is on the highest part of the structural high.

The presence of steam in B-15 and a probable steam zone in B-11, (as it produces 40% steam) suggests higher zones of permeability (predominantly fractures and faults?) in this area - above the water table - and the existence of a steam cap over this portion of the reservoir. The electrical surveys carried out in this area show an anomalous northwest trending low conductance zone extending from B-15/B-11 to B-3/B-8 and bordered on the northeast by the Alamo Canyon Creek (see Fig. 7). This may be the approximate extent of the steam cap if it is largely controlled by faulting and fracturing. However, the structure map on the base of the Bandelier tuff indicates the base to be structurally highest along the central part of Redondo Border and, if stratigraphically controlled, the steam cap would be located here (with faulting connecting it to B-11 and B-15?)

The above assumes that the steam encountered in B-15 is from the same reservoir as the water in the surrounding wells. Admittedly, this requires some peculiar plumbing in the reservoir as the casing in B-15 was set at +6608' whereas the vapor-liquid interface in the field is believed to be at about +7600'.

RESERVOIR ROCKS

The greater majority of producing zones thus far encountered in wells in the Redondo Creek area have been in the Bandelier tuff. The Paliza Canyon andesite appears to contain tuffs or open fractures, locally, which are capable of producing fluid. However, generally the andesite is very highly altered to clays and most fractures may be closed. The Tertiary sands which occur beneath the andesite are probably the zones most capable of producing fluids, but their extremely fine grain size and unconsolidated character cause the sand to flow with the fluids.

The success or failure of wells, then, is almost entirely dependent upon encountering open fractures in the Bandelier tuff. Fractures are obviously most abundant at the intersection of two faults and, for a better future success ratio, wells must be located at fault intersections and not merely at locations which are cheaper to build (at the expense of the well).

Figures 4-6 show that the area approximately outlined by B-6, B-4, B-13, and B-16 contains the maximum temperatures. It is expected that most of Redondo Border and its northwest flank may have similar temperatures and future exploratory wells should be located west and northwest of B-11, B-15, and B-16. Figure 8 shows this area to have 2,000' - 4000' of Bandelier tuff below the 400°F isotherm.