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CONCLUSIONS

Based upon the foregoing analysis, it is believed that a sizeable geothermal reservoir exists beneath the unconsolidated sediments of northern Dixie Valley, and that convection within this reservoir may bring water with a temperature of 200°C or higher to within a depth of 2 km (6,500 feet) beneath the surface.

Convection probably is most pronounced within the frontal fault zone of the Stillwater Range, where fracturing is most intense. Also, it is not likely to occur within the footwall or range-block. Within the leasehold, isotherms are likely to have their greatest upward deflection near and immediately east of the Dixie Comstock Mine.

Based upon their age and relative mineralogical stability, the Mesozoic basement rocks are thought to have greatest reservoir potential: fractures in them are likely to remain open for a longer time than in the overlying Tertiary volcanic rocks. The close association of high-temperature geothermal manifestations and outcrops of Jurassic gabbroic intrusives suggests that this is true.

RECOMMENDATIONS

In order to test the model presented above, it is recommended that two 1,500-foot test wells be drilled, one next to the Dixie Comstock Mine, and another about 1 mile to the east. These will indicate whether the high temperature gradients observed to 300 feet actually persist to much greater depths. Also, they will indicate whether or not the postulated convection cell exists, and, if so, if it has substantial breadth. The recommended locations are shown on Plate 13.

If these tests support the model, then one deep test well should be drilled to a depth of about 8,000 feet. This will determine if the desired temperature and reservoir conditions exist within the leasehold. This probably should be drilled near the eastern 1,500-foot test, although results from the two 1,500-foot tests may indicate a slightly different location.

It is not recommended that further geophysical work be carried out at this time. However, it will be useful to make a careful review of the gravity and magnetic surveys performed by Edcon, Inc. before final selection of test-well sites. These data may indicate additional details of buried fault surfaces that could argue for modification of the proposed drill sites.

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APPENDIX 1

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APPENDIX 3

HISTORIC SEISMICITY AND FAULTING IN DIXIE VALLEY, NEVADA

Historically, the Dixie Valley area has exhibited high seismicity, including several large earthquakes accompanied by surface faulting. It is part of the very active 118° meridian seismic zone, which extends from Owens Valley to Pleasant Valley. This zone experienced major earthquakes and surface faulting in 1872 (Owens Valley), 1903 (Louderback Mountains), 1915 (Pleasant Valley), 1932 (Excelsior Mountain), 1934 (Cedar Mountain), and in 1954 (Rainbow Mountain, Fairview Valley, and Dixie Valley).

Probably in 1903, the Wonder earthquake produced 3 miles of normal faulting in the Louderback Mountains, along the north-trending Gold King fault (Slemmons et al., 1959). This same fault was reactivated during the Dixie Valley-Fairview Peak earthquakes of December 16, 1954. These two shocks had magnitudes of 6.8 and 7.1., and were accompanied by extensive faulting from Mt. Anna on the south to Dixie Meadows on the north, in a belt 60 miles long by 20 miles wide. Thirty miles of this faulting occurred along the east flank of the Stillwater Range, near the bedrock-alluvium contact. Displacements were mainly dip-slip, and ranged from as large as 12 feet near Fairview Peak to 2 feet in Dixie Meadows (Slemmons, 1957). In August 1954, the Rainbow Mountain earthquake (M = 6.5) had produced some 25 miles of faulting on the west side of the Stillwater Range, with maximum displacement of 2 feet. Including generally minor right-lateral slip components (but up to 12 feet at Fairview Peak), the surface faulting showed NW-SE oriented extension of the area and westward tilting of the Stillwater-Fairview Mountain block, as well as downdropping and westward tilting of Dixie Valley. Geodetic data (Whitten, 1957; Meister et al., 1967) confirm these displacements, and indicate a net lowering of the ground surface in both mountain and valley blocks. First-motion data for the Fairview Peak earthquake fit the fault data very well.

Aftershocks of the 1954 events have continued up until the present time, and have been the subject of several published papers. In the winter and spring of 1965, Westphal and Lange (1967) recorded more than 1,300 local shocks in the area between the Louderback Mountains and Mt. Anna; activity was notably concentrated in the area of Bell Flat. Total recording time was 129 days. Focal depths ranged from 5 to 15 km. In the summer of 1966, Stauder and Ryall (1967) recorded more than 1,000 micro-earthquakes during six weeks in the Fairview Peak-Mt. Anna area. Focal depths ranged from 5 to 20 km but were chiefly in the range 10 to 15 km.

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Focal mechanisms were predominantly dip-slip, representing continued down-dropping of the Bell Flat graben. Unpublished microearthquake data recorded by R. Greensfelder, working for the U.S. Geological Survey, indicated continuing intense activity in this area during 1966, 1967, and 1968.

None of the above-described studies revealed significant activity north of the Louderback Mountains, partly because in all cases the station networks had their perimeters south of that area, and probably also because activity was much less there.

Since mid-1964, the University of Nevada, Reno, has operated a seismograph network in northern Nevada, with permanent stations at Reno, Unionville (in the Sonoma Range north of Lovelock), near Battle Mountain, and at Tonopah; several stations have been added since then, chiefly in the area around Mina, south of Walker Lake. The 1970 to present epicenter data are considered to be more precise than that before 1970, and epicenter data for Dixie Valley for 1970-1974 have been obtained from UNR. They cover the area from 39° 20' to 40° 00' north latitude, from the west side of the Stillwater Range to the east side of the Clan Alpine Range. About 160 events with magnitudes from 1.5 to 4.2 were located in this area, and were recorded by an average of 6 stations, but occassionally as many as 11. Standard errors of computed versus observed arrival times averaged less than about 0.35 second; therefore, computed epicenter locations are probably precise to within about 4 km at the 95% confidence level. Focal depths are unavailable for these shocks, but may reasonably be assumed to be from 5 to 15 km, based on earlier results in the area.

The 1970 to 1974 activity was notably concentrated in central Dixie Valley between the Louderback Mountains on the south and latitude 39° 45' on the north. No events were located within the project area or along the Stillwater Range frontal fault north to latitude 40° N. The nearest event to the south is along the Stillwater fault just west of Dixie Meadows.

Overall, the distribution of epicenters suggests three possible patterns of faulting, two or all of which may be real:

(1) aftershock activity of the 1954 'quakes continues at depths of from 12 to 20 km along the east-dipping Stillwater frontal fault system;

(2) seismicity, perhaps aftershocks of the '54 'quakes, is taking place along subsurface north-trending faults which are seen in both bedrock and alluvium in the Louderback Mountains area and which may extend as far north as Dixie Hot Springs; Holocene alluvial scarps in the valley exhibit a weak northerly alinement along this trend;

(3) a weak northwesterly alinement in the cluster of epicenters near about 39° 45' N suggests movement along a conjugate fault set.

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