RESERVOIR PERFORMANCE

The predominant producing mechanism for the Vacuum Glorieta Field has been solution gas drive with some water influx and pressure support from the surrounding aquifer. Although the field has produced significant amounts of water, especially on the edges, aquifer activity can best be described as encroachment rather than active influx providing any significant pressure support. A plot of historical production for the field, as well as maps of cumulative oil production, cumulative water production, cumulative water cut, cumulative gas production, cumulative gas-oil ratio, current oil producing rates, current water producing rates, current producing water cut, current producing gas rates, current producing gas-oil ratios and current reservoir pressure (Figures 23 through 34 respectively) all support this conclusion. All cumulative data was taken as of 1/1/90, and the current data is the 1989 average.

The historical production plot for the field (Figure 23) shows that initial production began in February, 1963 with full field development essentially completed in early 1967. Most wells in the field produced at the top allowable rate of 107 BOPD until early 1974 when the field began to go on decline as a whole. Water influx and pressure support from the surrounding aquifer were limited until the early 1974 period as evidenced by the fairly constant producing water cut of 25% (once full field development had taken place in early 1967) and constantly increasing producing gas-oil ratio from initial field discovery in early 1963. After early 1974 when the field had undergone significant fluid and pressure depletion and began to go on decline, aquifer encroachment began to contribute some support as evidenced by the steadily increasing water cut, flattening GOR and lessening reservoir pressure decline subsequent to this time. A historical plot of GOR, water cut and BHP is provided as Figure 24. The maps depicting cumulative and current producing characteristics for the field, Figures 25 through 35, also indicate some degree of increase in aquifer activity. Water cuts and reservoir pressure are generally higher and GOR's are generally lower on all flanks of the reservoir.

A close look at Figures 25 through 35 shows that the field has and is essentially behaving as two separate reservoirs producing independently of each other, one to the east and the other to the west. Note Figure 25 - the map of cumulative oil production for the field. Cumulative oil production delineates two separate areas with recoveries ranging from peripheral lows to center highs. Note also Figure 29 - a map of cumulative gas-oil ratio for the field. The same area to the east shows markedly lower GOR's than the area to the west. Reservoir pressure is also higher in the east. All of these maps bear out the existence of two separate areas which will have to be flooded under different scenarios for enhanced water (secondary) and CO_2 (tertiary) recovery. The west, with much more of a solution gas drive and much less water influx producing mechanism (higher GOR's, lower reservoir pressure and lower water production), holds a greater percentage of secondary oil than the east and may be waterflooded for an extended period of time before injecting CO_2. The east, on the other hand, has had a higher degree of water influx (lower GOR's, higher reservoir pressure and higher water production); therefore, CO_2 injection should be initiated in the east as soon as repressurization has occurred.