

range from 300-750 MCF per acre foot and 400-750 barrels per acre foot. Reservoir engineering studies of the character and behavior of some Morrow sands indicate that they should be capable of permitting efficient "sweep out" under secondary recovery.

Subsurface geology and imaginative thinking are essential to the exploration approach of the Morrow. Gravity and seismic methods are being used with success. This area is in the early stages of development, and many reserves remain to be found.

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Morrowan Series of North Texas Panhandle

Morrowan sediments are recognized in the subsurface over most of the northern Texas panhandle. Morrowan terminology is based primarily on lithology and stratigraphic sequence with some faunal identification. The rocks are predominantly shales with less amounts of limestones and sandstones. The sandstones are of prime economic importance in the production of oil and gas distillate, and account for a greater part of the recent discoveries in the panhandle.

ABSTRACTS

PACIFIC SECTION MEETING, LOS ANGELES, NOVEMBER 7 8, 1957

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Geological and Geophysical Studies at Railroad Valley, Nevada

In Paleozoic time 20,000 feet of sediments accumulated in the Railroad Valley area. Limestone and dolomite make up about 85 per cent of these sediments, with 5-10 per cent sandstone and the rest shale. Fossils and lithologic characteristics indicate most or all of these sediments were deposited in shallow water, but subsidence of the area was nearly continuous, and all of the Paleozoic systems are represented in the sequence of beds.

In late Paleozoic or early Mesozoic time the area was uplifted and no seas are known to have covered it since that time. Erosion produced a surface with slight to moderate relief, and beds ranging in age from Devonian to Permian were exposed. On these upper Paleozoic strata Tertiary lake and stream sediments and volcanic materials were deposited in thicknesses ranging up to 15,000 feet. These Tertiary beds can be subdivided into four groups which can be recognized in wells in Railroad Valley and in several nearby mountain ranges. Some diastrophism occurred in early and middle Tertiary time, resulting in several widespread unconformities, but the diastrophism which produced the present basin-and-range topography occurred after deposition of all of these Tertiary beds.

Seismic and gravity surveys were used to delineate structural features in the sediments beneath the valley. Both methods show that Railroad Valley is an asymmetrical basin with the greatest depths on the east. The gravity survey shows a major border fault probably is present on the east flank of the basin, and a series of horsts and grabens parallel the mountain on the west side of the valley. Seismic reflections outlined several structural highs which were tested; one of these produced oil in the Eagle Springs field.

Seismic reflections are not of the best quality in the valley, but the most numerous, reliable, and continuous reflections originate from within Tertiary and Quaternary clastic deposits. Reflections from greater depths are fragmentary, but often are useful. In some instances, the unconformity at the top of the Tertiary volcanics could be mapped. Reflections could not be obtained on the fan deposits at the edge of the valleys, where major border faults probably occur. In these regions gravity data were used to trace the faults, obtain estimates of their dips, and to outline the structure of the Paleozoic surface. Estimates of depth to Paleozoic rock in several basins along the axis of the valley could also be made from gravity data; these depths range from 7,000 to 15,000 feet.

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The west side of Baja California between 30° and 32° North exhibits a terrane of deformed pre-batholithic eugeosynclinal rocks, abundant batholithic and smaller intrusive bodies, and a coastal zone of relatively undeformed post-batholithic sediments.

The pre-batholithic section of great but unknown thickness consists of basic and intermediate volcanic pyroclastics and flows, graywackes, and rare carbonates. It has been intensely folded and faulted, and near contacts with plutonic intrusives is mildly to strongly metamorphosed. A persistent limestone zone has been a useful stratigraphic unit in regional study. Numerous fossils taken from this zone and from other horizons indicate Albian age.

Plutonic rocks of considerable variety intrude the eugeosynclinal terrane but occur most com-