

The Geology and Development of McArthur River Oil Field, Trading Bay Unit, Cook Inlet, Alaska

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The McArthur River Field, also known as Trading Bay Unit, is the largest producing oil field in Cook Inlet. It is estimated to have an OOIP of 2645 MMBO from four oil producing formations; three in the Tertiary and one in the Mesozoic. The field was discovered by the Union Oil Company of California (Unocal) Grayling-1A well. The well was completed in late 1965 and tested oil from the Hemlock formation just above 10,000 ft. TVD. Wireline and mud logs also indicated oil in the underlying West Foreland and overlying Tyonek "G" zone sands. During the following year several wells were drilled to appraise and define the limits of the field by Unocal, Atlantic Richfield and Pan American. The McArthur River Field was unitized in 1968 with Unocal named as operator of the Trading Bay Unit.

The McArthur River Field is located on the west flank of the Cook Inlet Basin, a forearc basin associated with the subduction of the Pacific plate beneath the accreted terrains of Alaska. The field is characterized by a NNE-SSW elongated broad fold that persists from the basement depths up through the shallow Tyonek sands near the surface. A number of high angle normal and reverse faults that penetrate up through the productive intervals have been mapped in the field. The main phase of structural development occurred in the Middle to Late Miocene as the Cook Inlet Basin underwent a period of increased transpression.

Field development began with the setting of three oil production platforms by early 1968. Production peaked at around 122,000 BOPD in October 1970. Pressure maintenance through a peripheral waterflood was instituted early in the development phase and production flattened at about 100,000 BOPD until 1977. A fourth platform was set in 1987 to develop the Grayling Gas Sands and deeper oil reservoirs in the Tyonek "G" Zone and West Foreland Formations. In the early 1990's a deep test of the Jurassic Formation discovered oil and was put on production, however, the accumulation has not been fully appraised or developed.

The oldest rocks penetrated in the field are the slightly metamorphosed marine volcanoclastics of the Early to Middle Jurassic. A significant erosional unconformity developed at the end of the Mesozoic followed by deposition of the Eocene West Foreland, Oligocene Hemlock and the Oligo-Miocene Tyonek formations. Holocene glacial deposits overly the Tyonek. The entire Tertiary section is characterized by fluvial deposits of conglomerate, sand and silt separated by overbank claystones and coal. The deep gravel-bed braided to sandy meandering depositional environments have created reservoirs of good quality and fair to moderate lateral continuity.

McArthur River Field has produced over 630 MMBO and is still producing with current rates of 3800 BOPD with a 95% water cut.