

## Abstract

### GEOLOGY AND GEOPHYSICS OF NORTHERN ALASKA

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Northern Alaska is separated from the remainder of the 49th state by the Brooks Mountain Range. It is the approximate northern one-third of the state, an area of about 70,000 square miles, with which this paper is concerned. It is divided into two administrative units with about 37,000 square miles in the Naval Petroleum Reserve No. 4 and 33,000 square miles under the Bureau of Public Lands.

Structurally, the area is a single asymmetric basin, similar in general structural aspect to the Denver-Julesburg basin and the Alberta basin. The principal sedimentary rocks of the basin are Cretaceous. Lithologically, the Cretaceous consists of a shallow sand-shale sequence about 3,000 feet thick (the upper Cretaceous) and an underlying shale (the lower Cretaceous) which thickens from 2,000' in the north to 20,000' in the south. The Brooks Range is a complex of thrust faults and related folds in the pre-Cretaceous. This thrusting continued and gave rise to a series of elongate east-west trending diapir folds in the Cretaceous. These extend about 100 miles north of the mountain front.

As a result of the Navy's exploration program, oil and/or gas was discovered at Barrow. Simpson. Umiat, Gubik and Fish Creek. None of these wells developed commercial quantities of oil but they do indicate that the area is a potential petroleum province.

The principal objective horizon would seem to be the Mississippian- Lisburne limes tone which is about 2,000 feet thick in outcrop and has some outcrop seeps and a petroliferous odor in fresh fracture. It was missing in the test wells drilled in the northern part of the area near Point Barrow.

It should occur in major thrust folds near the mountain front. Such a fold is interpreted at Carbon Creek anticline, a surface structure which

can be followed for about 100 miles in an east-west direction. The Lisburne was not drilled into during the course of the 1945 to 1953 exploration program.

Seismic results in the area were generally good and checked both the drilling and the surface geology, after being corrected for velocity variation. Gravity results seem to be useful to define structure in the higher density pre-Cretaceous. For example, there is gravity definition of the Carbon Creek thrust fold and of a pre-Cretaceous crypto-volcanic structure near Point Barrow. The airborne magnetometer results do not seem to be useful in defining structure in the sedimentary section.

Operation and support problems are, of course, complicated by remoteness and an inhospitable climate. These problems have been solved and costs were not materially different from any other "foreign" area. Although an extensive exploration program was conducted, it was quite limited relative to the size of the area. It would seem that the exploration program reached the stage of showing what needed doing.