

NOTES ON THE GEOLOGY OF THE ARROWHEAD PROJECT

December 7, 1965

INTRODUCTION

The B.A.-Texaco Arrowhead project is located in the southwest corner of the Northwest Territories, nine miles east of the Liard Range and nine miles northeast of the Fort Liard Settlement (Figure 1). It is bounded by West Longitudes $122^{\circ}45'$ and $123^{\circ}15'$ and North Latitudes $60^{\circ}20'$ and $60^{\circ}40'$.

The Arrowhead project lies in the Interior Plains physiographic division. Muskeg, glacial ridges, some small lakes and the valley of the Arrowhead River with dense tree and bush cover form the topography.

STRATIGRAPHY

General Statement

Stratigraphic information given below was obtained from two wells: B.A. Texaco Arrowhead B76 (Grid $60^{\circ}30'N$, $122^{\circ}45'W$) and B.A. Texaco Arrowhead N2 (Grid $60^{\circ}40'N$, $123^{\circ}W$). The attached stratigraphic cross section (Figure 2) shows the stratigraphic changes between the wells.

Pleistocene

The topmost beds consist of 100 to 200 feet thick glacial gravel and till containing many types of igneous rocks derived from the Canadian Shield. Many types of glacial deposits are present including fluvioglacial ridges (eskers) and moraines. The most recent deposits are river gravels in the valley of the Arrowhead River.



Mesozoic

Lower Cretaceous

The only Mesozoic beds present under the Arrowhead block are Lower Cretaceous sandstones and shales bounded at the top and at the base by unconformities. The Lower Cretaceous formations from the top downward are named the Sikanni and Buckinghorse formations. The Sikanni formation consists of an upper shale member and a lower sandstone member. Most of the upper shale member is truncated below the Pleistocene. In the Arrowhead B-76 well 35 feet of dark grey, fissile shale of the upper shale member is present below the Pleistocene gravel. In the Arrowhead N2 well the upper shale member may be present but was not observed due to poor samples. The sandstone member of the Sikanni formation underlies the shale member. The thickness of the sandstone varies between 250 and 300 feet. The sandstone is very fine to fine grained, quartzose, with varying amounts of glauconite and very rare shale interbeds. In Figure 2 (stratigraphic cross section) the Sikanni formation has been combined with the Pleistocene.

The Buckinghorse formation consists of an upper and lower shale member separated by the Scatter sandstone member. The upper shale member consists of about 600 feet of dark grey, silty, micaceous and glauconitic shale. The middle sandstone member (Scatter sandstone) is 100 to 200 feet thick and composed of light grey, quartzose and glauconitic sandstone, partly argillaceous and micaceous. The lower shale member is lithologically identical to the upper shale member and the thickness varies from 300 to 400 feet.

In the Arrowhead N2 well a 170 foot basal Cretaceous, medium grained quartzose sandstone underlies the lower shale member of the Buckinghorse formation and overlies the Mississippian Flett formation. In the B-76 well the lower shale member of the Buckinghorse formation forms the basal Cretaceous unit.

Jurassic, Triassic, Permian and Pennsylvanian beds are not present in the wells.

Mississippian

The Mississippian system is divided into the Flett formation underlain by the Banff and Exshaw formations.

The Flett formation is about 1,600 feet thick in the B-76 well and about 750 feet thick in the N2 well. The Flett comprises clastic limestones, silty and cherty with argillaceous interbeds. Limy shale beds are common near the base of the Flett. The Flett-Banff contact is

provisional at present. The Banff formation is 1,500 to 1,600 feet thick and is fairly uniformly composed of medium grey, micromicaceous shales with varying lime content.

The basal Mississippian Exshaw formation is 45 to 50 feet thick and comprises dark grey and brown pyritic shales.

Devonian

Upper and Middle Devonian strata are present below the Arrowhead project.

The Upper Devonian is composed predominantly of shale. The Kotcho formation at the top of the Upper Devonian is overlain unconformably by the Mississippian Exshaw shale and underlain by the Tetcho formation. The Kotcho formation is 1200 to 1250 feet thick and consists of medium grey, micromicaceous and slightly calcareous shale with rare silty intercalations. The "First Limestone" is a distinct limestone bed within the Kotcho formation east of the Arrowhead project. In the Arrowhead B-76 and N2 wells the "First Limestone" is a limy shale and can only be recognized on the logs.

The Tetcho formation underlies the Kotcho shale conformably. The Tetcho thickness varies between 110 and 140 feet. Fine clastic limestones, calcilutites and calcisiltites form the lithology of the Tetcho formation.

The Trout River formation, composed of 250 to 300 feet of limy, argillaceous siltstone and silty shale, underlies the Tetcho limestone conformably but its base is believed to be unconformable. However, erosion below the base of the Trout River formation cannot be demonstrated in the Arrowhead project. The Kakisa formation, a 60 to 80 feet thick limestone, silty in part, underlies the Trout River siltstone and overlies the undivided Redknife - Fort Simpson formations.

Further east the Jean Marie limestone member of the Redknife formation is present and serves as a means of separating Redknife and Fort Simpson formations. Under the Arrowhead project the Jean Marie limestone is not present.

The undivided Redknife - Fort Simpson formations comprise 1,900 to 2,050 feet of medium grey to greenish grey, partly silty and limy shale with rare pyritic content.

The top of the Middle Devonian in the southern Northwest



Territories has not been defined accurately. In this report the top of the Middle Devonian has been placed provisionally at the top of the Horn River formation. The Horn River is 31 feet thick in the B-76 well and 158 feet thick in the N2 well.

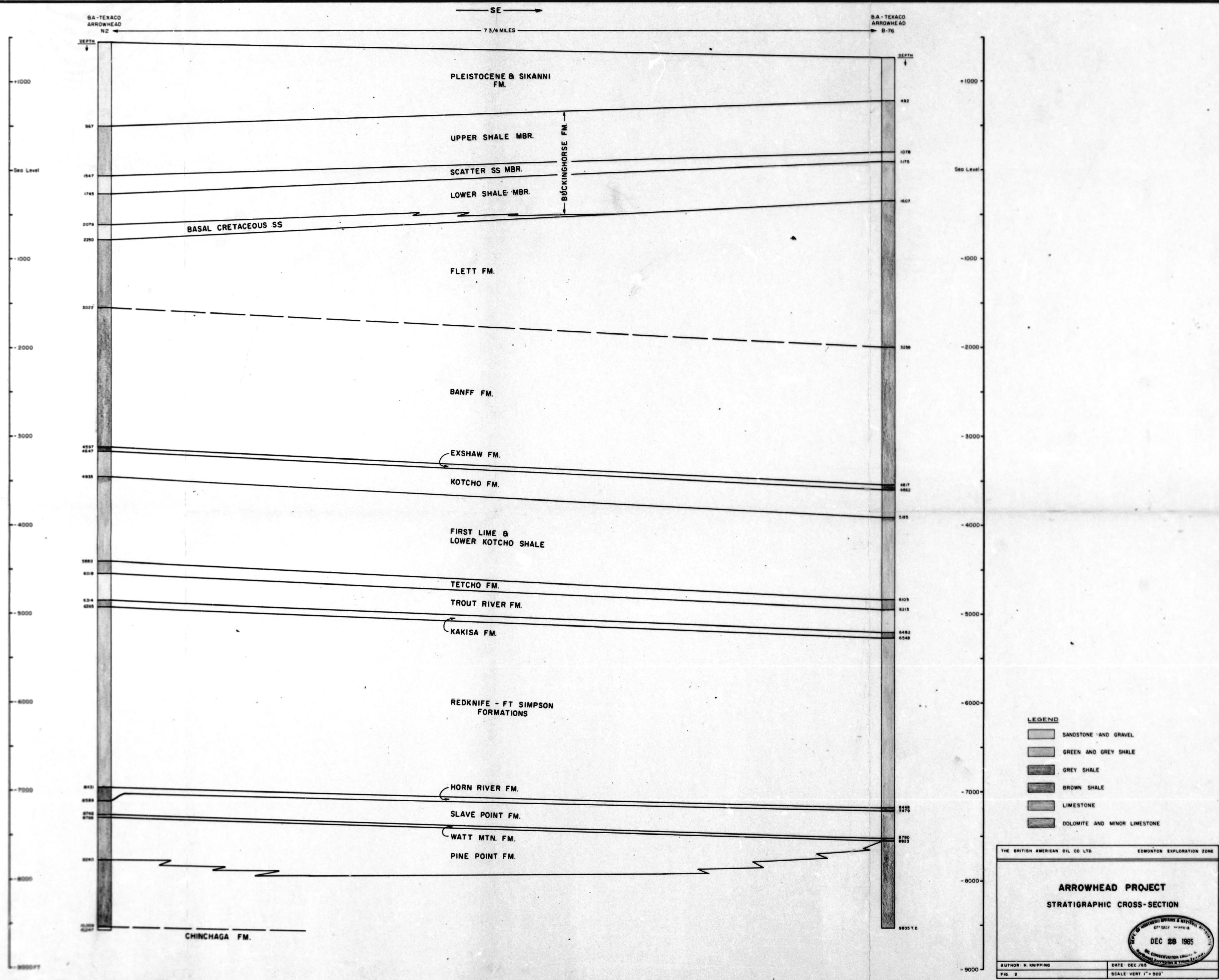
The Slave Point formation underlies the Horn River formation unconformably. The Slave Point is 311 feet thick in the B-76 well and 157 feet thick in the N2 well. Calcarenite and calcilutite limestones form the bulk of the formation except at the N2 well where *Stromatopora*, *stachyodes* and corals, constitute part of the rock. The Slave Point is underlain by the Watt Mountain formation, a 20 to 33 feet thick calcarenite with two bands of green waxy and pyritic shale at the top and the base.

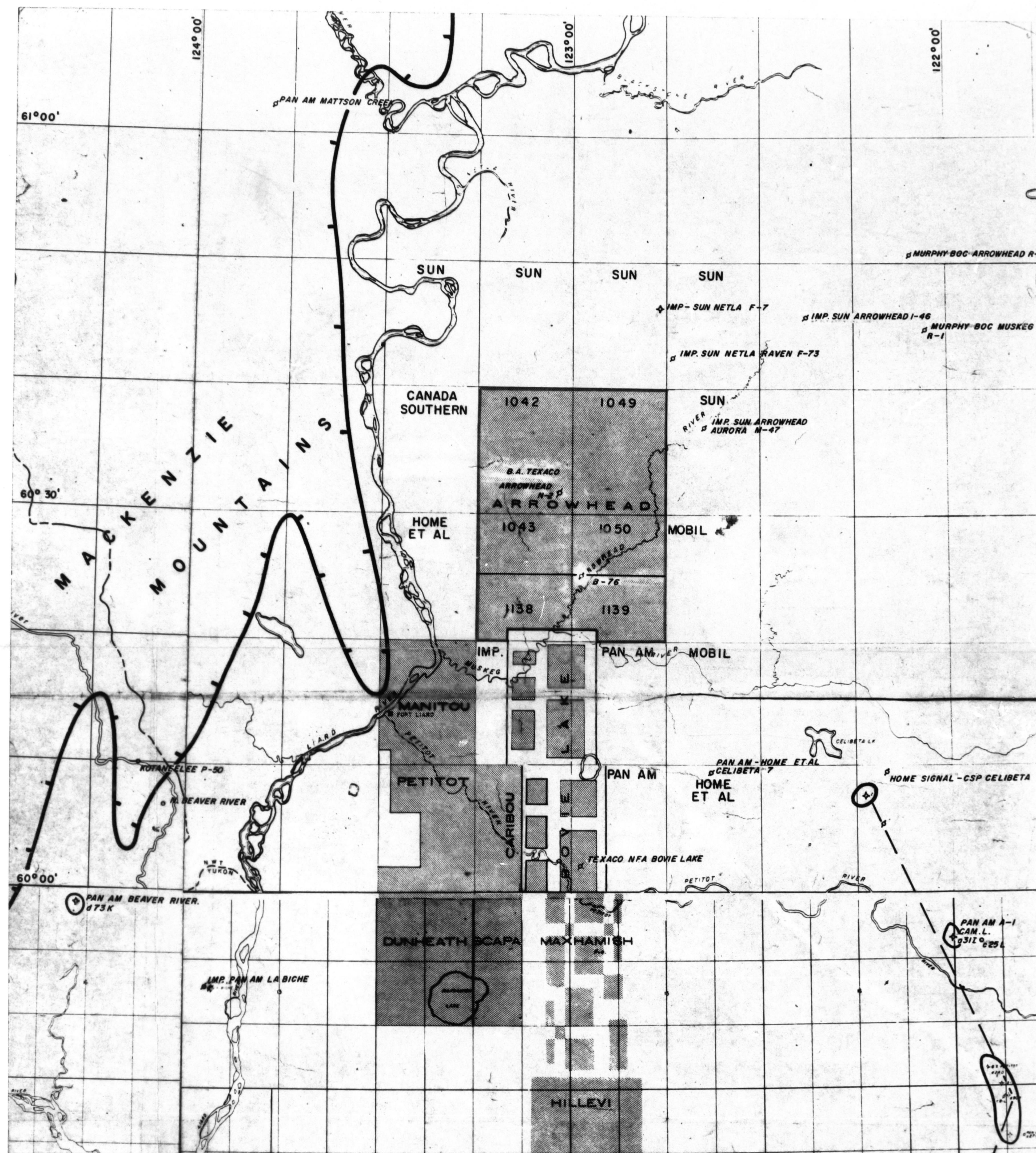
The Pine Point formation underlying the Watt Mountain contains two major facies, clastic limestone and dolomite. The nomenclature of the Pine Point is unresolved at present in the general area. The limestone facies at the top of the Pine Point has been called the Sulphur Point formation east of the Arrowhead project. Calcarenite and calcilutite limestones form the limestone facies of the Pine Point in the Arrowhead N2 well with a thickness of 474 feet. The underlying dolomite is 769 feet thick and contains a few thin limestone bands near the top. The dolomite is of several types. White, coarsely crystalline, porous dolomite occurs mostly in the upper half while medium grey to brownish grey, fine crystalline dolomite predominates in the lower half of the dolomite facies. Pyrite and secondary quartz growth are common in places. Porosity of vuggy and intercrystalline types is developed in the white, coarsely crystalline facies of the dolomite. The entire Pine Point thickness in the Arrowhead N2 well is 1,243 feet. In the Arrowhead B-76 well the Pine Point is dolomitized from the top down to total depth within the Pine Point. Only a few limy interbeds are present near the top of the Pine Point.

The Middle Devonian Chinchaga formation underlying the Pine Point was encountered in the Arrowhead N2 well. Only 38 feet was penetrated. The Chinchaga consists of light grey, very fine to fine crystalline, slightly anhydritic dolomite.

STRUCTURAL GEOLOGY

Structural relationships of the Arrowhead project are camouflaged by glacial drift. Structural mapping is dependent on seismic surveys.





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| THE BRITISH AMERICAN OIL CO. LTD. | | EDMONTON EXPLORATION ZONE | |
| ARROWHEAD AREA - N.W.T. N.T.S. - 94 NE & 95 SE | | | |
| LAND MAP SCALE: 1 INCH = 5 MILES | | | |
| ARROWHEAD PROJECT 5-1-4-14 | | | |
| DATE: NOV 26/65 | | BY: | |
| NFA | | ARROWHEAD PROJECT | |
| FIGURE 1 | | | |

