

# THE GEOLOGY AND OIL AND GAS POTENTIAL OF THE FLATHEAD AREA, SOUTHEASTERN BRITISH COLUMBIA

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## ABSTRACT

The Flathead area in the Rocky Mountains of southeastern British Columbia has a long history of petroleum exploration. Drilling activity began in the early 1900's, based on oil seeps in Precambrian metasediments, and resulted in some minor oil production. Subsequently, 17x10<sup>9</sup>m<sup>3</sup> (600BCF) of CO<sub>2</sub>-rich gas have been discovered in thrust faulted Paleozoic reservoirs beneath the Lewis thrust, in pools similar to those hosting large gas reserves in adjacent parts of Alberta. Significant potential remains in this area in a variety of geological settings, several of which are unusual for Western Canada.

The greatest remaining potential is in additional traps in thrust faulted Mississippian and Devonian reservoirs beneath the Lewis thrust. Undrilled structures have been identified on seismic data northwest of the productive structural trend, and Devonian strata have not been tested in structures to the east. In addition, the Peechee Member shelf-edge reef could form stratigraphic traps where it changes facies updip into interbedded shelf dolomites and anhydrites.

Sour hydrocarbon gases could occur east of the CO<sub>2</sub>-rich productive trend. Paleozoic strata have minor potential on structures above the Lewis thrust sheet because they are widely exposed and have been subjected to flushing by fresh water. The potential is greatest where they have been more protected from flushing by surface waters beneath Mesozoic and Tertiary strata in the Kishenehn Basin, but there Paleozoic strata were downfaulted into their current position after peak hydrocarbon generation and migration. Devonian Peechee Member pinnacle reefs could occur above and below the Lewis thrust, and because of their stratigraphic isolation, may have been less susceptible to flushing and introduction of CO<sub>2</sub>-rich gases.

Cretaceous strata have modest potential beneath the Lewis thrust sheet in combination structural-stratigraphic traps. The principal targets in this setting are in conglomerate-rich trends, where they cross structures, and to a lesser extent in marine, fluvial and deltaic sandstones. Cretaceous objectives could be gas or oil bearing, although gas is more likely in the lower parts of the Cretaceous. Above the Lewis thrust, Jurassic and Cretaceous strata have minor potential where they are buried beneath the Kishenehn Basin.

The Oligocene Kishenehn Formation is an important hydrocarbon objective in the Flathead area. It is up to 4750m thick and fills a post-Laramide extensional basin. Potential reservoirs include fluvial and lacustrine sandstones and conglomerates, and megabreccias. Lacustrine oil shales in the lower part of the formation have probably generated liquid hydrocarbons where deeply buried in the axis of the basin. These strata have been tested by only two deep modern wells. Similar small lacustrine basins in China are prolific oil producers.

Two smaller extensional basins occur in the southern Rocky Mountain Trench. The basin fill succession may be similar to the Kishenehn Formation, and potential reservoirs are likely to be comparable. In addition to biogenic gas, these strata may have been buried deeply enough to generate liquid hydrocarbons locally.

The coals of the Jura-Cretaceous Mist Mountain Formation are the targets of an active coalbed methane play north of the Flathead area. However, in the Flathead area, the coal-bearing section in the Lewis thrust sheet is thinner and has a more restricted areal extent. In addition, the coals may be undersaturated and require further investigation. Locally, the Mist Mountain coals may have some potential below the Lewis thrust.

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