

THE GEOLOGY AND OIL AND GAS POTENTIAL OF THE FERNIE-ELK VALLEY AREA, SOUTHEASTERN BRITISH COLUMBIA

P.A. MONAHAN, P.GEO.

ABSTRACT

The Fernie-Elk River Valley area is a geologically complex and relatively unexplored area in the Front Ranges of the southern Rocky Mountains. Although no conventional hydrocarbon reserves have been found in the area to date, large reserves have been established in adjacent parts of Alberta and British Columbia. Furthermore, the Fernie-Elk Valley area is the foremost coal mining area of British Columbia, and an active coalbed methane exploration program is currently underway.

The most significant conventional hydrocarbon objectives are in thrust faulted Mississippian and Devonian carbonates beneath the Lewis thrust. Two major structural trends occur in this setting: an essentially untested 100km long trend of sub-Lewis duplexes beneath a belt of Paleozoic outcrop in the Lewis thrust sheet; and a poorly tested trend of duplexes beneath the leading edge of the Lewis thrust sheet. Both duplex trends could contain large reserves. Mississippian and Devonian strata also have potential in structures on the Lewis thrust sheet, principally west of the Flathead and Erickson normal faults. The Devonian Peechee Member (Leduc-equivalent) shelf-edge reef is prospective where it crosses structures both above and below the Lewis thrust, and stratigraphic traps could occur in this reef trend in the Lewis thrust sheet where it is deeply buried beneath the Bourgeau thrust sheet. Stratigraphic traps could also occur in the Lewis thrust sheet in Peechee pinnacle reefs and possibly in reefs in the Devonian Borsato and Nisku Formations. In most areas, Paleozoic reservoirs are potentially gas-bearing, although gases are likely to be sour and may contain high concentrations of CO₂ in the southern and western parts of the area. However, oil could occur locally in Devonian strata in the hanging wall of the Lewis thrust where Cretaceous strata are present in the footwall. Mesozoic strata have potential for modest conventional hydrocarbon resources in a band a few kilometres wide beneath the leading edge of the Lewis thrust sheet. There, structural-stratigraphic traps could occur in Triassic dolomite and Jurassic and Cretaceous conglomerates and sandstones. Triassic and Jurassic reservoirs would probably be gas-bearing, but Cretaceous reservoirs could contain either gas or oil.

A vast coalbed methane resource is present in the Jura-Cretaceous Mist Mountain Formation. Drilling activity for which data are available has not resulted in commercial production, due in part to incomplete well testing. Furthermore, drilling locations were not optimally located on gentle folds, where permeability could be enhanced, or to evaluate the upper coal seams of the Mist Mountain Formation, which have better developed cleat systems. A current drilling program in the Elk Valley Coalfield is still confidential but appears to include wells better located to evaluate the coalbed methane potential of the area.

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