Mopping up the Stratigraphic Mess: Reinvestigation of the Stratigraphy of the Laberge Group (Jurassic), South-Central Yukon, Provides New Insights in the Exploration for Gas and Oil in the Whitehorse Trough

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ABSTRACT

The Whitehorse Trough is an immature, mainly gas-prone basin containing an estimated 25,000-116,000 million cubic metres of gas in south-central Yukon. It is thought to have originated in Middle to Late Triassic time as a forearc basin and is represented by three stratigraphic units, termed the Lewes River Group (Upper Triassic-Lower Jurassic), the Laberge Group (Lower-Middle Jurassic) and the Tantalus Formation (Upper Jurassic-Lower Cretaceous), all of which contain potential source rocks and/or reservoirs. However, only fair to poor exposure, extensive folding and faulting, rapid facies changes, lack of stratigraphic markers, and a poor understanding of the regional stratigraphy throughout the basin hamper future hydrocarbon exploration. Hence, the Geological Survey of Yukon has initiated a long-term study of the structural and stratigraphic setting of the Whitehorse Trough.

Previous researchers subdivided the Laberge Group into four formations (i.e., from the base upwards, the Richthofen formation, consisting 'silty shale', the Conglomerate formation, consisting of 'matrix and clast supported conglomerate', the Nordenskiold Dacite, consisting of 'massive dacite tuff', and the Tanglefoot formation, consisting of 'arkose and feldspathic sandstone'), and for the past 20 years these units have been accepted by most workers. However, the formations are poorly defined and no type sections have been described; subsequently, the formations have been variously recognized and interpreted. Preliminary investigation of these formations reveals they are not stratigraphic units and they have been misidentified and incorrectly mapped. The units are redefined as lithostratigraphic units and in some cases their distribution is restricted. In particular, the Richthofen formation is restricted to the southern part of the basin; in the central part of the basin the Richthofen formation is unconformably and/or conformably overlain by the Tanglefoot formation; and in the northern part of the basin the Tanglefoot formation unconformably overlies the Lewes River Group. Also, the Conglomerate and Nordenskiold units appear to be minor units within the Tanglefoot formation.

This revised stratigraphy provides new insights in the exploration for gas and oil in the Whitehorse Trough. For example, the Richthofen-Tanglefoot formation unconformity and/or conformity is a potential gas play in the central Whitehorse Trough, whereas the Lewes River Group-Tanglefoot formation unconformity is a potential gas and oil play in the northern Whitehorse Trough.