Stratigraphic Analysis of the Cretaceous Taylor Creek Group Along the Southern Margin of the Chilcotin Plateau: Potential Linkage Between the Methow and Tyaughton basins

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Introduction

Cretaceous strata within and south of the Chilcotin Plateau of south-central British Columbia are traditionally described as occupying several distinct basins, including the Nechako, Methow and Tyaughton basins. The original geometric relationships between these basins is difficult to reconstruct due to Eocene and Neogene volcanic cover and the presence of a Tertiary dextral transpressive fault system along the southern margin of the Plateau (Figure 1). Reconstruction of the original basin architecture is crucial for accurate assessment of the hydrocarbon potential of Nechako basin strata in the subsurface beneath the Chilcotin Plateau. Ongoing investigations (Mustard et al., 2007) are attempting to constrain facies distribution of Cretaceous strata in the subsurface through detailed stratigraphic analysis of coeval, laterally adjacent strata of the Methow and Tyaughton basins exposed along the basin margins.

The Methow and Tyaughton basins are Jurassic-Cretaceous successions of predominantly clastic strata overlying allochthonous Paleozoic to Triassic oceanic and volcanic arc rocks of the Methow, Bridge River and Caldwallader terranes. These basins contain a number of unconformity-bounded stratigraphic packages representing Middle Jurassic, Late Jurassic, and Cretaceous depositional sequences that have been dismembered along a series of Tertiary dextral faults with offsets estimated at 10's to 100 km. The Lower Cretaceous interval in each basin is characterized by thick successions of well-sorted lithic to quartzofeldspatic arenite intercalated with mudstone intervals. The Jackass Mountain Group (JMG) of the Methow Basin is a thick (1000's of metres) succession

originally interpreted as a submarine fan complex, but now recognized as a vertically and laterally complex system with non-marine, shallow marine and sub-wavebase marine deposits. Coeval rocks of the Tyaughton Basin are contained within the Taylor Creek Group, a thick succession of Lower to Upper Cretaceous deltaic to submarine fan deposits.

In the Chilko Lake-Nemaia Valley area, Cretaceous strata of the Methow and Tyaughton basins south of the Yalakom fault are separated by Tertiary high-angle dextral faults of unknown displacement (Figure 2). The northern part of the

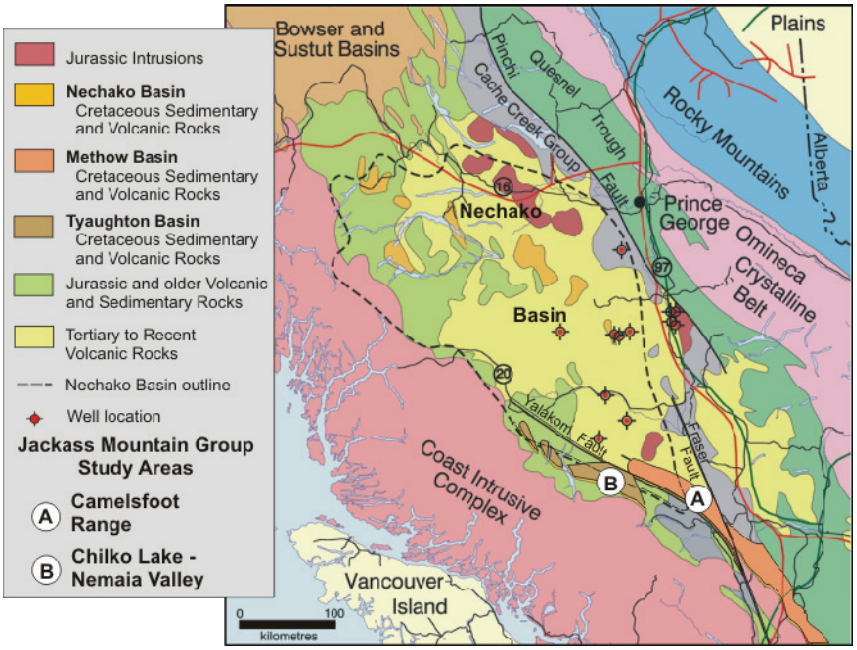

Figure 1: (modified from Ferri and Riddell, 2006)

area contains a major, gently southeast-plunging synclinorium cored by JMG strata of the Methow Basin (MacLaurin et al., 2008). The JMG in this area contains thick, moderately well-sorted sandstone bodies (10's m in thickness) with abundant trough and hummocky cross-stratification as well as flaser and lenticular bedded facies indicative of upper shoreface environments. These shallow marine strata are overlain by turbidite sequences suggesting that the basin evolved from shallow marine to outer shelf/slope environments through time. JMG strata are truncated to the south by a series of high-angle dextral faults that appear to structurally disrupt a major anticlinorium centered on the Nemaia Valley (Figure 2). Immediately southeast of these faults, a succession of lithologically similar strata currently assigned to the Taylor Creek Group of the Tyaughton Basin is exposed on the flanks of Mt. Ts'yl-os (Mt. Tatlow). If it can be demonstrated that strata on Mt. Ts'yl-os are correlative to JMG strata in the northern synclinorium, then a Lower Cretaceous link between the Methow and Tyaughton basins can be established. This linkage would significantly expand the known areal extent of Lower Cretaceous strata in the region, which is crucial for accurate assessment of the original basin architecture and hydrocarbon potential.

Cretaceous Strata on Mt. Ts'yl-os

A 1445 metre stratigraphic section was measured on the northern flank of Mt. Ts'yl-os, and subdivided into three distinct lithofacies (Figure 3):

Lithofacies 1 (200 m): Basal100 metres consists of a dark grey shale intercalated with thin-bedded cross to parallel laminated micaceous chert lithic arenite. Plant material and small channeled beds are noted locally. This unit is overlain by an organized, massively bedded, pebble to cobble chert – rich conglomerate forming nested channel sets composed of abundant,

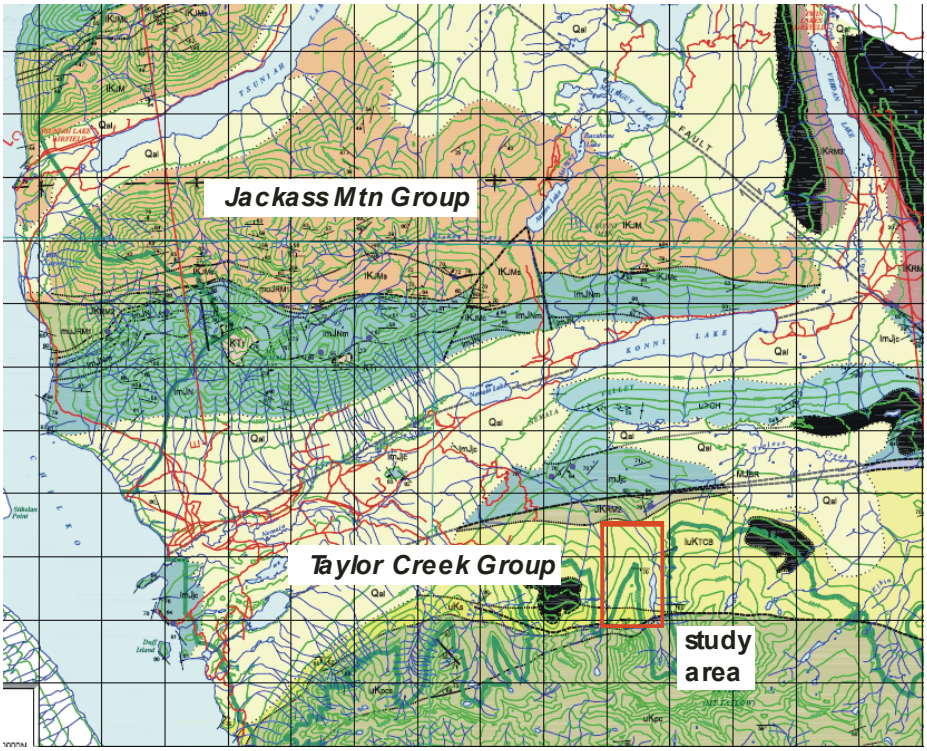

Figure 2: Regional geologic map (Schiarizza et al., 2002)

overlapping lenticular, crudely stratified channels. This lithofacies is interpreted as an incised channel in a marginal marine, probably deltaic setting, and is believed to be correlative to the Dash Formation of the Taylor Creek Group.

Lithofacies 2 (500 m): Lithofacies is dominated by recessive dark grey, bioturbated shale with minor parallel to cross laminated calcareous lithic feldspathic arenite. Rare ammonites indicate a marine setting. Section is inflated by numerous andesite porphyry sills. Lithofacies 2 is interpreted as a subwave-base marine unit, possibly prodelta muds or distal submarine fan. This unit is interpreted as correlative with the Lizard Formation of the Taylor Creek Group (Schiarizza et al., 1997).

Lithofacies 3 (700+ m): A coarsening upward succession of chert pebble conglomerate and associated sandstone intercalated with siltstone and shale that gradationally overlies Lithofacies 3. Lithofacies 3 is dominated by a series of 50-100 m thick coarsening upward megasequences that internally contain 5-15 m fining-upward sections of conglomerate, lithic arenite, siltstone and mudstone. Erosive bases, channels, and trough cross-stratification are common in coarse grained intervals, parallel laminations to cross-laminations are common in fine grained intervals. Section becomes richer in plant debris and more heavily bioturbated upward and locally contains hummocky cross-stratification near the top. Lithofacies 3 is interpreted as a prograding upper to lower delta plain distributary system, and is interpreted to be correlative with the Silverquick Formation associated with the Taylor Creek Group.

Detailed sedimentologic and stratigraphic analysis will be coupled with ongoing thin section petrography, shale geochemistry (REE and isotopes), palynology, macro- and microfossil studies, and detrital zircon analyses in both the JMG and the Taylor Creek Group to test the proposed stratigraphic correlations.

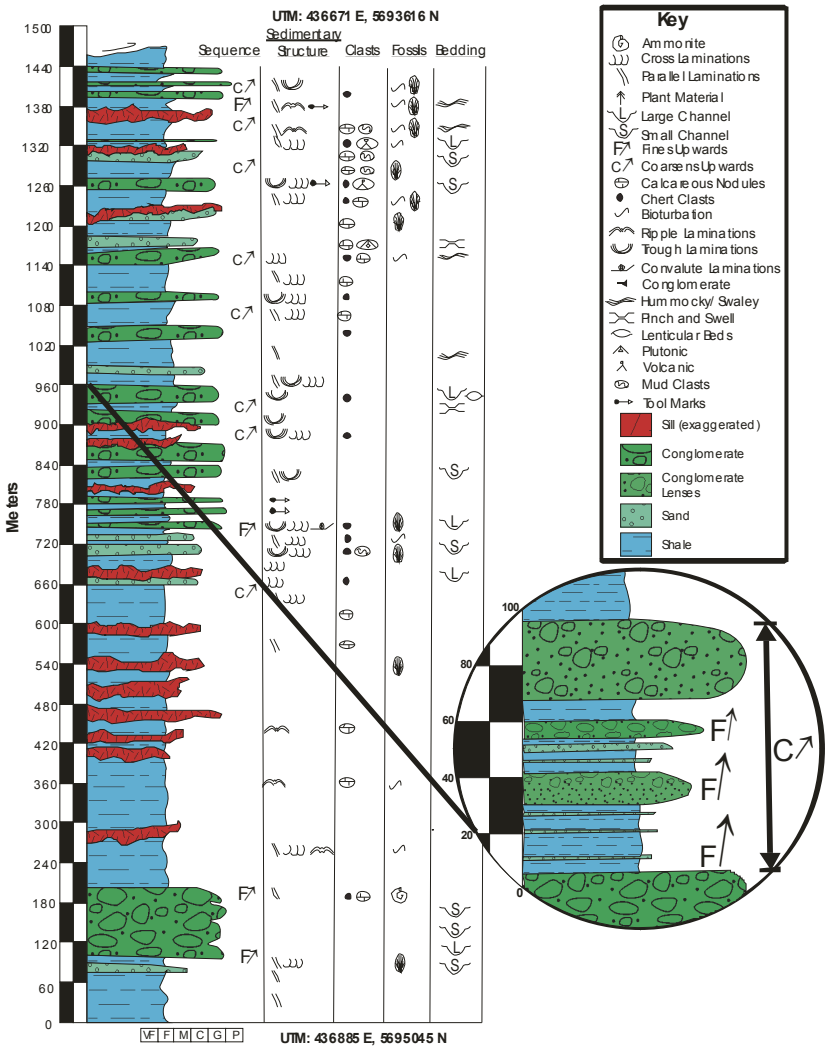

Figure 3: Stratigraphic section on the north flank of Mt. Ts'yl-os

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