New lithogeochemical and Pb isotope data from the Buchans area, central Newfoundland

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Recent geochemical and Pb isotope research carried out in the Buchans mining camp and funded by Buchans River Ltd. and Billiton Exploration Canada Ltd., has revealed a number of interesting features. These include demonstration of a definite geochemical difference between foot-wall and hanging-wall rocks at the Lucky Strike ore-body. The foot-wall rocks are slightly calc-alkaline-transitional dacites, whereas the hanging-wall rocks are calc-alkaline rhyodacites. The presence of these two distinct bounding lithologies to the ore horizon suggests that hydrothermal exhalation/ore deposition occurred in a period of relative quiescence during which the magmatic affinities of the enclosing volcanic rocks changed. This delineation of hanging-wall/foot-wall chemistries could prove to be an effective exploration tool for Buchans-style Zn–Pb–Cu mineralization.

Felsic volcanic samples from the Buchans East area are tholeiitic to transitional, whereas those in the Buchans camp proper generally are calc-alkaline to calc-alkaline-transitional suggesting that the eastern rocks are not Buchans Group *sensu stricto*, but are composites of Buchans Group and tholeiitic sequences.

The new geochemical data also raise some questions about the whole nature of the Buchans Group as presently defined and suggest that the area may be petrogenetically more internally complex than previously thought. The REE and HFSE data for basalts from the Clementine West area are tholeiitic and completely unlike the typical Buchans River Formation. Yet Pb isotope data, base metal and Ba contents,

alteration assemblages and the overall lithological context of the samples suggest that they are coeval parts of the Buchans rocks.

The prominent quartz rhyolite (PQR) is also an enigma. Wherever sampled, east or west of Buchans, it is definitively calc-alkaline with elevated Ba contents and resembles the "typical" calc-alkaline signature of the Buchans River Formation; this implies at least a spatial link between the Buchans camp and the Buchans east area. The PQR appears to be *in-situ*, possibly intrusive, at many localities in the Buchans area, but is also the apparent source of the Sandy Lake Formation epiclastic sequence. REE and HFSE data also suggest that spatial geochemical variations occur in the PQR itself. In the Lucky Strike area, the PQR has the most enriched Th and Zr anomalies of all samples analysed.

Pb isotope data suggest that the Pb isotope compositions in galena separates define (a) distinct groupings and (b) a mixing line between the groupings. The Buchans ore bodies themselves define a very tight clustering. The mixing line ranges from most primitive (least radiogenic) in the Tower Zone to most radiogenic in the Middle Branch East - Mary March zones. Other Buchans region samples plot with Pb from the tholeiitic Skidder Prospect suggesting that the Pb in the Buchans region represents a mixture between a least radiogenic, Skidder-type tholeiitic mafic environment and a more radiogenic calc-alkaline (?) felsic environment.