

# **Volcanic Stratigraphy and Nature of Epithermal-style Gold Mineralization in Upper Devonian-Lower Carboniferous Volcanic Rocks of the Northeastern Cobequid Highlands, Nova Scotia**

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Within the northeastern Cobequid Highlands of mainland Nova Scotia Late Devonian to Early Carboniferous volcanic, volcanoclastic, and lesser siliciclastic rocks of the Byers Brook and Diamond Brook Formations together constitute a substantial, exceptionally well-preserved, continuous, and near-vertical volcanic succession nearly 10 km thick. The magmas are distinctly, but not universally, bi-modal in composition and at the regional scale, the felsic volcanoclastic rocks of the Byers Brook Formation underlie the basalt dominated Diamond Brook Formation. Formation of the volcanic succession within a subsiding intercontinental rift-basin is consistent with the lava chemistry, the thickness of the deposits, and current understanding of the regional tectonics of the Appalachian Orogen at this time period. U-Pb zircon ages for rhyolite flows within the upper Byers Brook Formation and lower Diamond Brook Formation yielded ages of ca. 358 and 355 Ma respectively, the age of the base and the top of the volcanic succession are uncertain. The unconformably overlying, shallowly dipping siliciclastic rocks of the ca. 310 Ma Boss Point Formation flank the northeastern margin of the Cobequid Highlands and provide a minimum age. Portions of the lowermost Byers Brook Formation are intruded by the multiphase A-type Hart Lake Byers Lake Pluton which yielded a U-Pb zircon age of ca. 362 Ma.

New detailed mapping within the Byers Brook and Diamond Brook Formations has provided several new and important discoveries: (1) epithermal-style Au mineralization has been confirmed via visible Au found within silicified/sulfidized basalt within the Warwick Mountain area (western Byers Brook); (2) associated with the new Au discovery are anomalous concentrations of As, Cd, Sb, and Pb; (3) numerous locations within the Byers Brook and Diamond Brook Formations are host to silicified and sulfidized volcanic rocks containing anomalous concentrations of one or more of the following elements (As, Ag, Cd, Sb, Pb, Zn, Se, Cd), and thus may also contain Au; (4) The main centre for rhyolite magma and subsequently basaltic magma production and eruption was within the most easterly portions of the preserved Byers and Diamond Brook Formations; (5) the subdivision of the Diamond Brook Formation needs revision to reflect the east to west transition from exclusively compound vesicular basalt flows to stratigraphically equivalent intercalations of basalt, felsic volcanic/volcanoclastic rocks and notably significant occurrences of epiclastic and siliciclastic rocks.

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