An overview of volcanogenic massive sulfide (VMS) deposits of the Newfoundland Appalachians: lassification, mineralization styles, and grade-tonnage data

STEPHEN PIERCEY[1] AND JOHN HINCHEY[2]
1. Mineral Exploration Research Centre, Department of Earth Sciences, Laurentian University, Sudbury, ON, P3E 2C6 Canada
¶ 2. Geological Survey of Newfoundland and Labrador Department of Natural Resources, P.O. Box 8700, St. John's, NL, A1B 4J6 Canada

The Newfoundland Appalachians host more than 40 volcanogenic massive sulphide (VMS) deposits that contain >

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100,000 tonnes of sulphide-rich material. Collectively, they represent an aggregate geological resource of ~112 million tonnes (geological resource) with production and reserves of ~ 46 million tonnes. At current metal prices past production would be worth ~ CAN $43 billion, whereas the geological resources of these deposits (i.e., past production, reserves, potential resources) would be worth CAN $60 billion.

Cambrian to Ordovician volcanic-arc, arc-rift, and back-arc basin assemblages within the Dunnage zone host the bulk of the VMS deposits of the Newfoundland Appalachians. The deposits can be classified into five main groups: 1) mafic-type deposits (Cu-rich, mostly hosted by ophiolitic rocks – e.g., Bay of Islands, Little Deer); 2) bimodal mafic-type deposits (Cu-Zn rich, hosted by bimodal sequences dominated by mafic rocks – e.g., Rambler, Ming, Point Leamington); 3) bimodal felsic-type deposits (Zn-Pb-Cu-rich, hosted by bimodal sequences dominated by felsic volcanic rocks – e.g., Buchans, Duck Pond); 4) felsic siliciclastic deposits (Zn-Pb-Cu-rich, hosted by sediment-rich bimodal sequences – e.g., Boomerang, Tulks East); and 5) hybrid bimodal felsic deposits (VMS-epithermal hybrids – e.g., Bobby's Pond, Daniels Pond).

There has been considerable past research on VMS deposits in central Newfoundland leading to an outstanding regional geological and tectonostratigraphic framework for mineralization. In recent years, however, there have been major advances in our knowledge of VMS deposit emplacement history (i.e., exhalative versus sub-seafloor replacement); alteration systems; and the volcanic, sedimentary, and intrusion facies associated with mineralization. These new advances will be critical for future exploration and genetic models for VMS deposits in Newfoundland. These new advances, coupled with recent exploration successes in central Newfoundland (e.g., Boomerang, Lemarchant), production at the Duck Pond deposit, and advanced projects (e.g., Ming), suggest a very bright future for VMS exploration and development in central Newfoundland.