

From The Mineral Inventory Files

Volcanogenic Massive Sulphides at the Stirling Zn-Pb-Cu Deposit

Nova Scotia's only genuine example of a volcanogenic massive sulphide (VMS) deposit is found at Stirling in southeast Cape Breton Island (Fig. 1). Also known as the Mindamar Mine, this deposit produced 1.2 Mt of 6.4% Zn, 1.5% Pb, 0.74% Cu, 2.2 oz. Ag/ton and 0.03 oz. Au/ton. Originally discovered as a Cu occurrence in the 1890s, by 1904 the deposit was producing Cu from a small open cut. In 1915 Zn-Pb sulphides were recognized in nearby trenches. Diamond-drilling, sinking of a shaft, and limited underground development commenced and continued until 1925. Mining was initiated by British Metals as Stirling Mines Limited in 1927. The company deepened the shaft to 240 m and constructed a 250 ton per day mill. Mining continued until 1931 but then ceased due to low metal prices. The property remained dormant until 1949 when Mindamar Metals Corporation re-evaluated the operation, and optioned it to Dome Explorations Limited in 1951. Dome constructed a larger mill and sank a second, 357 m deep shaft, and mined the deposit until 1956. Since then, there have been several concerted exploration efforts directed at both the known deposit and the interbedded sequence of mixed volcanic and sedimentary rocks that extend northeast and southwest of the deposit for over 30 km. This trend of similar geology and associated hydrothermal alteration has become known as the Stirling Belt (Fig. 1).

The Stirling deposit consists of a sequence of Late Precambrian volcanoclastic rocks and flow units that range from mafic to intermediate and felsic compositions (Fig. 1). This volcanic pile is intruded by small intrusions, sheets and dykes of predominantly gabbroic composition. Many of these intrusions display features suggesting they are subvolcanic in origin and thus related to the volcanic pile they intrude. The volcanic sequence youngens toward the northwest and rocks beneath the lens-shaped sulphide ore bodies are typically more felsic.

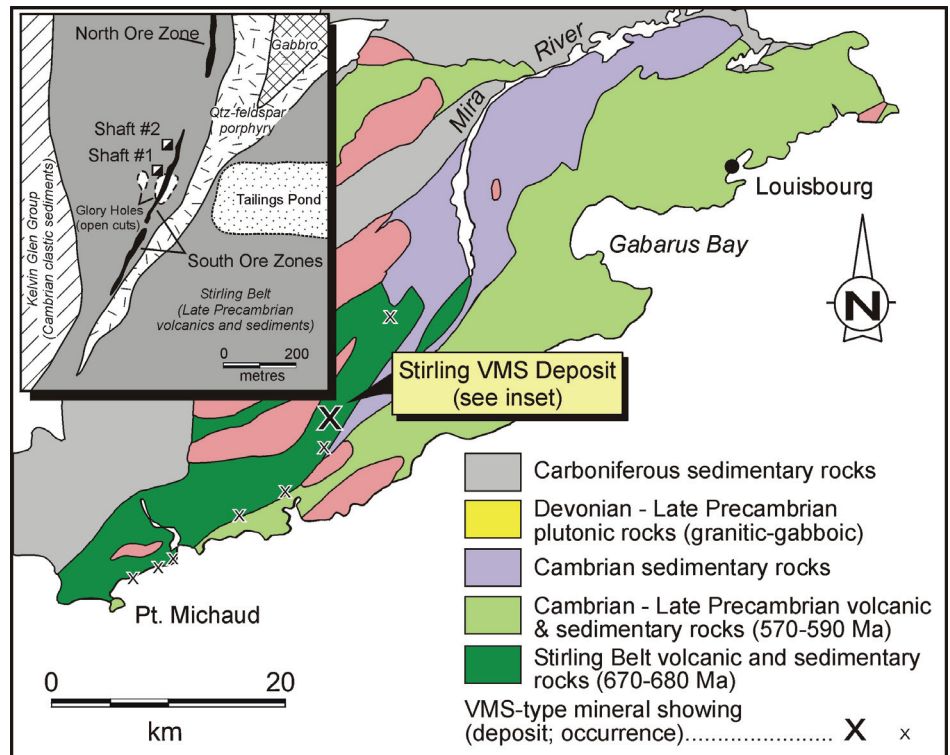


Figure 1. Geology map of southeast Cape Breton Island showing the Stirling Belt, the Stirling Pb-Zn-Cu deposit and other smaller VMS occurrences. Inset is a plan map of the former Stirling mine.

Evidence of widespread hydrothermal alteration abounds at Stirling, with zones of carbonate, silica, sericite and epidote occurring in various combinations. Most prominent are thick sequences of quartz-talc-carbonate (QTC) alteration found throughout the package but especially developed below the sulphide lenses. The complexity and intensity of alteration have resulted in conflicting theories of origin. Originally, the ore was thought to be epigenetic replacement deposits formed by magmatically derived fluids migrating along the prominent shear zones that traverse the property. During the 1970s, however, close examination of the style of mineralization showed that it compares very favourably with the model for the volcanic-exhalative Kuroko massive sulphide deposits in Japan. General thought was that the QTC rock

is an exhalative layer related to the same processes that gave rise to the massive sulphide lenses as the volcanic plumes vented out on to the ancient sea floor. Even though there has been some modification of this model, suggesting that the QTC rock is due to massive replacement of the host volcanics as opposed to a purely exhalative origin, the fact remains that there is a very strong case that Stirling represents a typical VMS deposit.

There have been numerous exploration efforts and scientific studies at Stirling since the cessation of mining in 1956. Unfortunately, none have resulted in any further mining. These efforts, however, have produced strong indications that the Stirling deposit and the entire Stirling Belt form a truly prospective VMS terrain.

G. A. O'Reilly