Categorizing mineralogy and geochemistry of Algoma type banded iron formation, Temagami, ON

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This project examines Algoma-type BIF, an Archean chemical sediment associated with sequences of volcanic rocks and greywacke, that is considered to be a direct product of hydrothermal venting on the seafloor [1]. Despite decades of mining at the Sherman Mine in Temagami during the 1970s and 80s, little is known about the ore types and their origins other than their classification as Algoma-type BIF. More than 10 million tons of iron ore from the Sherman Mine was excavated from three large open pits which are located in two east-west trending lobes of BIF. More than 300 massive blocks of ore were left at the edges of the pits from which they were removed, providing an excellent archive of the ore types in the mine. An outcrop of Algoma-type BIF outside the mine has provided samples for many studies of Archean ocean chemisty [1,2].

This project characterizes the mineralogy, sedimentary features, and trace-element geochemistry of more than 200 samples from the Sherman Mine to reconstruct the variations in ore type. Ore types in Sherman Mine are defined by the type of iron oxide, bedding thickness, and concentration of rare-earth elements. Of particular interest is whether hematite, magnetite or ferrous hydroxide was the primary iron oxide precipitate and how those minerals have been transformed into the present-day assemblage. These conditions have particular bearing on the redox state of the Archean ocean [3]. Field mapping in the Sherman Mine has yielded a general ore classification based on commonly observed mineral assemblages. Using ArcGIS, samples from the north and south lobes are compared to determine shared mineralogical, geochemical and sedimentary characteristics of each. With archived data from the Geological Survey of Canada, mapping provides insight into the area's tectonic history. Enigmatic field relations between different lobes of BIF are further complicated by inconclusive age estimates between 2.72 and 2.76 Ga [4]. The mapping results make sense of the geological context of the BIF units, with wide implications on earlier and future geochemical results.

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