A study of the crystal-chemistry and origin of Ni-bearing magnetite in Cu-Ni-Fe-(PGE)-S footwall veins at the Morrison deposit

C Beckett-Brown[1] **and AM McDonald**[1]

[1]Department of Earth Science, Laurentian University, Sudbury, Ontario

The Morison deposit is represented by footwall-hosted, Cu-Ni-Fe-(PGE) veins that are dominated by chalcopyrite and pentlandite ± pyrrhotite. Magnetite (Mag) is also a major constituent, representing 10-15 modal % of the veins, developing in sub- to euhedral crystals, 0.1-0.5 mm in size within the sulphide matrix. In an effort to better understand the crystal-chemical features and paragenesis of the Mag in these veins, 10 samples covering 3050–4800 ft. levels have been examined. Results indicate that the Mag are inclusion free and this, in combination with their occurrence as well-developed crystals, suggests they are primary, crystallizing prior to the sulphides. Analyses by SEM-EDS indicates they are Mag, but with unusually Ni-rich compositions, with Ni ranging from 1200-5600 ppm. Results from LA-ICP-MS analyses indicated a number of trace elements to be present, including; Mg, Al, Ti, V, Cr, Mn, Co, Zn, Ga, and Ge. It is noteworthy that none of these correlate with variation in Ni content. This development of primary, Ni-bearing Mag has important implications for understanding the formation and evolution of the Cu-Ni-Fe-(PGE) footwall veins and broadly towards the partitioning of Ni oxide- and sulphide-rich melts.