

## **Characterization and Emplacement of Sharp Walled Cu-Ni-PGE Sulfide Veins at the Broken Hammer Deposit, Sudbury, Ontario**

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Sharp-walled sulfide veins and low sulfide Cu-Ni-PGE deposits (footwall deposits) of the 1.85 Ga Sudbury impact structure have been mined for decades. Although these deposits are structurally controlled, very little publically-accessible data exist on the orientation and formation of the structures hosting these two styles of footwall mineralization. Deformation of the Sudbury impact crater by the 1.849 Ga to 1.820 Ga Penokean Orogeny resulted in the elliptical shape of the structure and cross-cutting shear zones. Both crater modification immediately after the impact and Penokean deformation may have produced the structures hosting mineralization within the footwall rocks of the eroded remnants of the impact melt sheet, the Sudbury Igneous Complex (SIC). The Broken Hammer deposit is located in footwall rocks along the northern margin of the SIC. The deposit was completely mined out as an open pit operation over the span of 1 ½ years, and provided a unique opportunity to study a footwall mineralized system in its entirety. The sharp walled sulfide veins and their low sulfide Cu-Ni-PGE alteration haloes were mapped in detail as mining progressed. The study revealed that the apparently “chaotic” nature of the vein system consist of systematic well-defined vein orientations. The fracture system exploited by the veins was likely emplaced as a combination of crater related fractures and conjugate sets. Analysis of slickenlines along the veins suggests that the reactivation was during an east/west compressional event that also produced a new set of conjugate shear fractures, into which remobilized sulfides were emplaced.