Method development for systematic separation of <63µm heavy mineral fraction from bulk till samples

J Pickett[1], D Layton-Matthews[1], B McClenaghan[2]

[1]Department of Geological Sciences and Engineering, Queen's University, Kingston, Ontario; [2]Natural Resources Canada, Geological Survey of Canada, Ottawa, Ontario

Future undiscovered ore reserves are currently buried under recent sedimentary cover. Capacity to see through the complexities of sedimentary cover and to perceive the ore environment and overall geology has become a fundamental aspect of modern mineral exploration in the glaciated terrain of Canada. This research is examining the physical processes of mineral and element dispersal in the <63µm size-fraction of till. The laboratory research and field orientation case study will be investigated by Queen's University, in collaboration with the Geological Survey of Canada (GSC), to develop novel methods to examine and characterize the <63µm heavy mineral fraction of till. The completed research can be broken down into 3 parts. First, we are developing methods for the separation of the <63µm size fraction of heavy mineral concentrate (HMC) by experimenting with settings (mode/oscillation and flow rate) using the HS-11 software operated hydroseparator™ based on different mineral densities and grain sizes. Using the hydroseparator™ proves to be the most reliable method in recovering these size fractions based on reviews and past studies with other HMC separation methods. The second part is to develop methods for the representative sampling (split) of the <63µm size fraction of sperrylite HMC in blank light fraction till using controlled and real sample separation techniques. Finally, we apply the developed methods to real till samples collected from the Southern Core Zone (Northern Quebec, Labrador, Newfoundland). Environmental Scanning Electron Microscopy used in conjunction with Mineral Liberation Analysis (ESEM-MLA – Queen's University) will be used to characterize the modal mineralogy of each sample. Many indicator minerals in bedrock sources are <0.25mm and are rarely characterized in glacial sediments because of our inability to separate, visualize, and chemically analyze these very small mineral grains. In being able to use the <63µm size fraction along with the glacial history, dispersal trains can be detected from more distal regions and aid in exploration targeting below surface deposits. Studies have yet to look at grains of such a small size and doing so could expand the horizon for searching for mineral deposits within glaciated terrain. This new method will make the 20-45µm and 45-63µm fractions easier to interpret as they provide fewer ambiguous indicator mineral counts than the <20µm fraction. The separation and understanding of the <20µm fraction may lead to new and exciting discoveries both in mineral exploration and scientific research.