Geochemical characterization and geochronological assessment of the Kiyuk Lake gold project, Kivalliq region, Nunavut*

Corresponding author: Stacie Jones, Department of Geological Science and Geological Engineering, Queen’s University, stacejonesie@gmail.com

Co-author: Kurt Kyser, Department of Geological Science and Geological Engineering, Queen’s University, kyser@geol.queensu.ca

The Kiyuk Lake property, currently optioned to Prosperity Goldfields Corp., is located in the underexplored southwest corner of the Kivalliq region of Nunavut. The study area is situated within the Hearne Domain of the Western Churchill Province, a Proterozoic block comprising the Rae, Hearne, and Chesterfield domains that amalgamated by the middle of the Proterozoic (~1.9 Ga). In the region of the Kiyuk Basin the Hearne Domain is mainly composed of Proterozoic sedimentary rocks of the Hurwitz and unconformably overlying Kiyuk Group. These sedimentary packages are thought to represent a continental rifting event.

Successful exploration in Nunavut has been restricted to the coastal and more northern regions of the territory due to accessibility and logistical requirements. Little economic or academic work has focused on southern Nunavut or gold in particular. Prosperity has conducted three drilling campaigns returning intervals from their Rusty zone of 37.8 m at 4.2 g/t Au, 61.5m at 3.3 g/t Au and 36 m at 4.95 g/t Au warranting further study to help understand the mineralizing system in the region of minimal rock exposure. The gold mineralization at Rusty is commonly associated with pyrrhotite plus minor pyrite or to a lesser extent pyrrhotite-magnetite +/- hematite. These mineralizing assemblages have veined and brecciated the clastic units and can be observed partially replacing sandstone fragments or disseminated in altered conglomerate units.

By understanding the deposit and identifying the potential for additional deposits in the region this project would open southern Nunavut up for further exploration and interest. Petrographic, QEMSCAN, and SEM studies are used to develop a mineral paragenesis to serve as a base and to further characterize the alteration and mineralization leading to the development of systematic exploration guidelines. Geochemical compositions indicate the type of alteration associated with gold mineralization and the chemical progression of the host rock through the alteration phases, thereby revealing possible pathfinder elements for future surface exploration. Stable O and H isotopes of calcite, dolomite, and quartz veins associated with the gold indicate the origin of the fluid, and more importantly, the effective fluid/rock ratios and processes involved in the mineralization. Radiogenic isotope tracing and dating of key mineralizing phases is a current goal of this study, with U-Pb dating of zircons from the sedimentary host rocks providing additionally age information of timing of deposition. It is the aim of this project to ascertain the timing of gold mineralization, determine the chemistry of the hydrothermal fluids that transported the gold, and to develop systematic exploration concepts to help explore for deposits like Kiyuk Lake in the future.