NEW FIELD OBSERVATIONS AND U-PB AGE DATA FOR FOOTWALL (TARGET) ROCKS AT SUDBURY: TOWARDS A DETAILED CROSS-SECTION THROUGH THE SUDBURY STRUCTURE.

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Introduction: Despite much progress in the understanding of the 1850 Ma Sudbury impact structure, numerous questions on the evolution of this structure, its igneous complex and fill, its target rocks and their deformation history persist. A more detailed understanding of the polyphase deformational history of the Sudbury area would help constrain the "unfolding" of the structure. As preserved today, the Sudbury structure and its igneous complex (SIC) merely represent a down-folded (and faulted) erosional remnant of an initially much larger structure, with a centre and original extent that can only be speculated upon. A detailed cross-section across the deformed erosional remnant, incorporating all field observations, would help inform the overall interpretation. Obtaining precise ages on some of the target rocks has proven difficult due to most zircons having seen substantial Pb loss at multiple times, notably at 1850 Ma or shortly thereafter (during or after the impact event and associated shock metamorphism), but also at other times (e.g., multiple Proterozoic events). Discordance patterns are further complicated by variable degrees of recent Pb loss, making upper intercept age interpretations uncertain and non-unique. The only definitive answer on some of the key ages will come from more concordant data. The ability to analyse smaller and smaller single grain fragments, and to pre-treat these with "chemical abrasion", may finally resolve some of the key ages.

Creighton Granite: One major rock unit in target area (along the South Range) that has not been precisely dated is the "Creighton Granite". Field evidence suggests that this intrusion may be a shallow subvolcanic granodiorite sill that was the magma chamber for the Copper Cliff Rhyolite Formation, a multi-facies rhyolite and volcaniclastic formation further south within the folded Huronian stratigraphy. It is likely that the Creighton granodiorite, some smaller porphyry bodies higher in the stratigraphy, and the Copper Cliff Rhyolite form a single magmatic system, compositionally distinct from the Murray Granite. The overall map pattern of the Creighton granodiorite, as well as reversals in younging directions in lower Huronian strata near its inferred base, indicate that the Creighton intrusion is a sill-like body that was tightly folded in a fold-thrust belt that predates the Sudbury impact and the cross-cutting basal contact of the SIC. Mafic rocks along the northern contact of the granodiorite sill are not "inclusions" but more likely simply represent the hot base of the folded sill. Along its base, the granodiorite sill intruded into plagioclase megacrystic gabbro sills of the Matachewan event, with evidence for magma hybridization, thus indicating that felsic magmatism immediately followed a major pulse of the Matachewan event. Although Matachewan dykes are numerous north of Sudbury, we know of no Matachewan dykes that cut the Creighton granodiorite sill or Copper Cliff Rhyolite.

Preliminary U-Pb results: So far we have preliminary data on six samples that help constrain relationships both along the North Range and the South Range. All zircon analyses were on small, most translucent fragments of single zircon grains, and all were treated by chemical abrasion. A brief summary of results follows:

Joe Lake (meta)gabbro, North Range. Field observations suggest this body was penetratively deformed as part of the Levack gneiss basement complex. Three initial zircons, probably metamorphic in origin, indicate a minimum age of 2657±9 Ma, corroborating our field observations for a late Archean origin.

Cross-cutting pegmatite dyke, North Range. Undeformed, shallowly dipping, granitic pegmatites cut through the deformed Joe Lake metagabbro. Initial analyses indicate an upper intercept age of ca. 2660 Ma, in agreement with the field relationships.

Murray Granite, South Range. Although our least discordant result, indicating a minimum crystallization age to 2429±2 Ma, is less discordant than previous data in the literature, substantial uncertainty remains on the crystallization age of this granite body. Our data are consistent with those of Krogh et al. (1996), suggesting crystallization at 2477±9 Ma.

Creighton Granite, South Range. Our data indicate a minimum crystallization age of 2437±2 Ma, thus eliminating any possible suggestions of a much younger age (e.g., see thesis by Smith, 2002).

Copper Cliff Rhyolite, South Range. Again our initial results are more concordant than any previous data, indicating a minimum crystallization age of 2455±3 Ma. The data are compatible with the Creighton Granite and Copper Cliff forming a single magmatic system. Regressing the best data from both the Creighton and Copper Cliff together yields an upper intercept age of 2465±15 Ma. A tentative age of ca. 2455-2460 Ma would be in agreement with all analytical data and field relationships and would mark the end of the magmatic phase of the Huronian rift in the area.