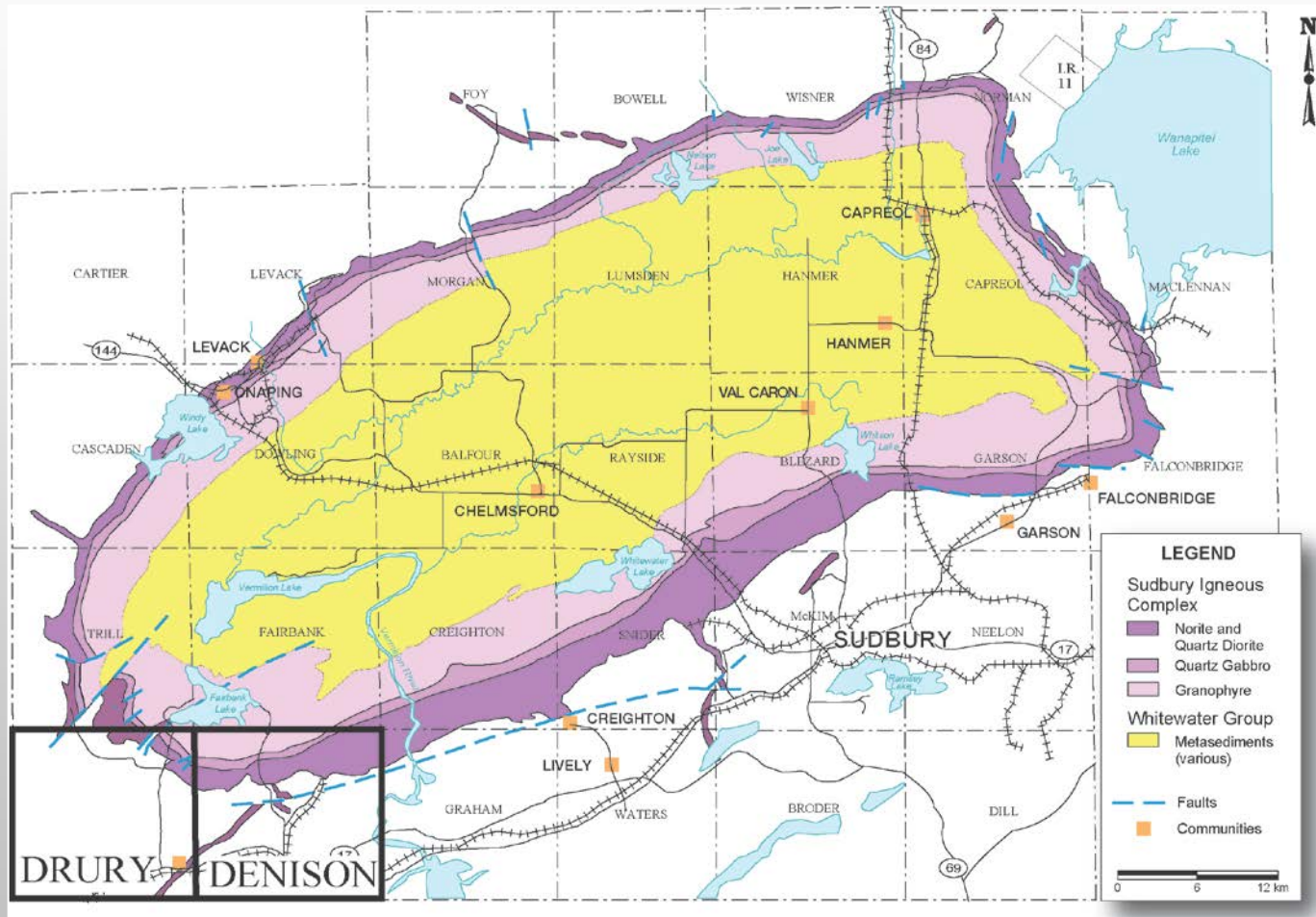


Low Sulfide PGE-Rich Sudbury Footwall Mineralization Research



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Goal: Develop an integrated geological, geochemical and geophysical Exploration Model for Low Sulfide, PGE-rich mineralization

Duration: 5-year Project – June 2015 start

Collaborators:

- University: MERC/DES researchers/students
- Industry: Glencore- SINO, KGHM, Lonmin, and Wallbridge
- Government: Ontario Geological Survey
- NSERC

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Objectives (Research Themes):

Characterization of:

1. Mineralization (including metallurgical characterization), sulfide, oxide (alloys) mineralogy, mineral chemistry, textures, grain-size
2. Structural and lithological controls, rock types, textures, structures, and metamorphism
3. Alteration mineral (mineral assemblages), mineral chemistry, textures, structure
4. Surficial geochemical expression of buried mineralized zones in transported surficial media

Identify characteristics that show measurable spatial variation within and with proximity to low sulfide PGE-rich mineralized zones (features that can be examined systemically and in 3-D to develop an exploration model).

Theme 1: Mineralization Characterization

Research Team: Pedro Jugo, Andy McDonald, Mike Lesher

HQP: 1 PhD student

Problems : Are there different subtypes? What is the mineralogy of the ores? How variable is it? Are there a spatial/genetic links to sharp-walled veins/contact ores? Is there a way to extract more useful information from whole-rock data?

Research Goals:

- (1) To characterize mineralogy and metallurgy (establish variability, mineralization sub-types, mineral processing base line).
- (2) To distinguish mineralogical trends diagnostic of mineralization from those that are common to unmineralized areas (hence non-diagnostic).
- (3) To use mineral chemistry (e.g. trace elements in sulfides, oxides, and silicates) as 'fingerprints' of specific ore types.
- (4) To link mineralogical data with whole-rock data (via mineral chemistry).
- (5) To assess possible links to sharp-walled veins (or contact ores).

Deliverables relevant to exploration model development:

- (1) Geometallurgical baseline and refined classification of the ores
- (2) Integrated mineralogical, mineral-chemistry, whole-rock database
- (3) Identification of mineralogical/mineral chemistry exploration vectors

Theme 2: Structural and Lithological Characterization

Research Team: Bruno Lafrance, Doug Tinkham, Dan Kontak, Harold Gibson (DES-MERC) and OGS geologists

HQP: 1 PhD (sponsored by the OGS), 2 MSc + summer students

Research goals:

- (1) Roles played by pre-, syn-, and post-impact structures and lithology on the primary emplacement and remobilization of low-sulfide footwall mineralization
- (2) Basic characterization of host rocks to mineralization and changes in the host rocks with proximity to mineralization and the SIC
- (3) Relative timing of anatexis, metamorphism, and fluid migration in relation to structural evolution

Deliverables relevant to exploration model development:

- (1) Determination of the orientation and timing of structures and lithofacies controlling mineralization
- (2) Determination of the effects of subsequent orogenic events on mineralization
- (3) A predictive structural and lithological characterization model for low sulfide, PGE-rich footwall mineralization

Theme 3: Alteration Characterization

Research Team: Dan Kontak, Matt Leybourne, Mike Lesher, Michael Schindler, Harold Gibson

HQP: 1 PhD, 1 Post-doc + summer student assistants

Research goals:

- (1) Characterize the chemistry (major, trace element) of epidote in low-sulfide footwall (LSFW) mineralization and compare/contrast with other settings;
- (2) Geochemical characterization of nature and scale of LSFw mineralization;
- (3) Lithogeochemical characterization of host rocks in LSFw mineralized settings;
- (4) Integrate PTX conditions of LSFw mineralization with PTt evolution of the footwall environment to the SIC.

Deliverables relevant to exploration model development:

- (1) Define the geochemical signature alteration associated with LSFw mineralized environments;
- (2) Define scale of alteration in LSFw mineralized settings;
- (3) Assess types of LSFw mineralization in context of Sudbury and other genetic types.

Theme 5: Surficial Expression Characterization

Research Team: Matt Leybourne, Andy McDonald (DES-MERC); Andy Bajc, Richard Dyer, Stew Hamilton
OGS

HQP: 1 PhD (sponsored by the OGS)

Problems: The primary research goals of this sub-project will be to determine if surficial geochemistry can be used effectively to discover new areas of low sulfide PGE mineralization. Surficial geochemical techniques are impacted by A) the poor understanding of the formation of these deposits, and B) the long history of smelting in the Sudbury region, which has produced a high background for many metals of interest.

Research Goals: This research will A) determine the extent to which the geochemical signature of low sulfide PGE mineralization is expressed in the surface environment, B) determine if only mechanically transported anomalies can be identified from shallow mineralization, or whether deeper mineralization can be detected by vertically transported metals, and C) what combinations of sampling strategies, geochemistry and isotopic methods can be used to remove anthropogenic effects on the surface geochemical environment.

Deliverables

- New bedrock and surficial maps, reports
- New geochemical data (rock & surficial media) and geochronological data
- Determination of the orientation and timing of structures and lithofacies controlling mineralization
- Determination of the effects of subsequent orogenic events on mineralization
- A predictive structural and lithological characterization model for targeting low sulfide, PGE-rich footwall mineralization
- Establish geochemical and heavy mineral characteristics in till to vector to buried surface/near surface low sulfide PGE mineralization
- Training of highly qualified professionals
- Science and technology exchange