Geological Mapping of Boundary Structures

Dr. Daniele Regis & Dr. Duane Petts

July 5 – July 22, 2023

Waste Management & Spill Contingency Plan
with mitigation measures

1. Introduction

This activity's novel research will develop new analytical tools to directly link field- and macro-scale observations with micro-structural and geochemical data to investigate trace element and precious metal mobility during metamorphism and deformation along major boundary structures. These new tools will be applied to samples collected during targeted fieldwork North of Rankin Inlet, with an emphasis on investigating tectonic structures associated with mineralization. By applying our research tools, we will: model fluid and mineral reaction pathways in 3D, improve our understanding of element mobility along shear zones and complex metamorphic terranes, and contribute to the development of geological models for the formation of ore systems in metamorphic rocks. The main outcomes of the project will address critical gaps in the geoscience knowledge of the area, increase mineral exploration effectiveness and success rates, provide a foundation for local land-use decisions and stimulate the local economies and create social benefit opportunities. Results will be made freely available through the Natural Resources Canada website and will be reproduced in a manner which allows uptake and understanding by local communities.

2. Location and Schedule of Activities

Proposed geoscience mapping will target bedrock exposures along the newly identified Raptor Shear Zone, which is located ca. 60-100 km N and NW of the hamlet of Rankin Inlet (Figure 1). All operations will be based in this community (hotel accommodation) according to a schedule discussed and recommended by the HTO(s) and residents (in person meetings in March 2023 in the hamlets of Baker Lake, Rankin Inlet and Chesterfield Inlet). Proposed geoscience mapping, sample and data collection will take place over ~ 17 days from July 5th to July 22nd, 2023. In detail:

- **July 5th-July 12th activities** will focus on setting up the base of operations in Rankin Inlet and visiting Agnico Eagle Meliadine mine (accessible by road with permission) and/or Solstice mine camp to examine/work on their collection of drill cores.
- **July 12th –July 19th activities** will involve, helicopter-assisted mapping based out of Rankin Inlet. No camps outside of Rankin Inlet will be setup, and no fuel caches will be necessary (bulk fuel will be utilized out of Rankin Inlet airport). The field research utilizes non-destructive, low-impact instruments such as GPS, digital cameras, and rock hammers. We expect approximately 200 fist-sized samples will be collected for analyses in the Geological Survey of Canada laboratories. Field data will be downloaded daily from handheld computers into a Geospatial database. Report of field work in English and Inuktitut will be prepared and released in Fall 2023. Acquisition of geochemical data and isotopic analyses will start in September 2023.

3. Preliminary Plan

A map showing the proposed region of bedrock mapping is attached as a separate file (Figure 1). This map shows the location of Rankin Inlet (base of operations), NTS sheet numbers, as well as the location (with UTM coordinates) of the Raptor shear zone.

4. Description of Undertaking & Equipment, Impacts

Mapping will involve examination and documentation of exposed bedrock along the Raptor Shear zone north of Rankin Inlet (see Figure 1). Coverage will be via low-impact foot traverses by 2-3 person teams comprised of any of the following project proponents and/or participants (Daniele Regis and Duane Petts), GSC Postodctoral Fellow Riccardo Graziani, MSc candidate Trevor Matterson and MSc supervisor Prof. Desmond Moser (Western University, London, ON) and 1 or 2 community members (wildlife monitors). Transport to the exposures will be by helicopter' which will return the teams to Rankin Inlet each evening.

All equipment to be used by an individual will fit into a small backpack to be provided to each field participant along with a bagged lunch. Examination of rock exposures is done using a hand lens, structural compass for measurements, pen magnet, hammer (to break off a fresh rock sample), and digital camera. Observations and interpretations will be recorded on small, hand-held computers that also record locations with GPS.

No camps, buildings, ditches, trenches, dams, roads, or other structures will be constructed.

5. Fuels

No fuel caches will be established. For the proposed research, we will utilize bulk fuel from Rankin Inlet airport. In the unlikely event of a fuel spill (at the airport and/or in the field), spill kits will be available at the refuelling site and on the helicopter.

6. Waste

Operations will be based in Rankin Inlet; there are no foreseen waste issues related to sewage, greywater, food, or garbage. Our teams will practice leave no trace principals (https://leavenotrace.ca/the-seven-principles-of-leave-no-trace/) while on the land.

7. Predicted environmental impacts and proposed mitigation measures

No permanent or long-term environmental impacts are expected from the proposed mapping activity. A helicopter (Bell 206 L3 or L4) to transport the crew to each exposure can land without any disruption to the tundra. Established airports will support the helicopter base and spill kits will be available.

7.1 Wildlife, including habitat and migration patterns

The Rankin Inlet HTO office (in person meeting with Andre Aokaut, March 2023) informed the project proponents that the area of interest (Figure 1) is part of the spring Caribou migration route. The caribou herd will be in the area between Rankin and Chesterfield Inlets for the month of July. The HTO has ca. 15 active GPS collars on the caribou and will be able to locate them when the mapping crew will be in Rankin Inlet. Project proponents agreed to meet with the HTO board when in Rankin in July, to discuss daily the location of the herd, and plan the helicopter work accordingly.

8. Risk Assessment and Mitigation of Risk

No fuel caches, propane tanks, diesel heaters, or gasoline are required for this activity.

9. Spill Responses and Contact List

Nunavut & NWT 24-hour Spill Report Line
(867) 920-8130

Water Resources Inspector for Crown-Indigenous Relations & Northern Affairs Canada
(formerly INAC)
Iqaluit, NU
(867) 975-4550
24-hour pager (867) 766-3737

GN-Dept of Environment (DOE)
(867) 975-7700
Manager of Pollution Control and Air Quality
(867) 975-7748

Kivalliq Inuit Association, Lands Department
32-4 Sivulliq Avenue
340 Rankin Inlet, Nunavut XOC-0G0
Ph.: (867) 645-5731
Toll free 1-800-220-6581
FAX: (867) 645-2348

Miren Lorente
GEM-GeoNorth Priority Manager
Geological Survey of Canada, Natural Resources Canada
467-601 Booth St.
Ottawa, ON K1A 0E8
Telephone: 343-597-0176

9.1 Basic Steps – Spill Procedure

In the case of any spill or other environmental emergency, it is necessary to react in the most immediate safe and environmentally responsible manner. No spill or incident is so minor that it can be ignored, and every spill must be reported.

The basic steps of the spill response plan are as follows:

- Ensure the safety of all persons at all times.
- Identify and find the spill substance and its source, and, if possible, stop the process or shut off the source.
- Inform the on-site coordinator or his/her designate at once, so that he/she may take the appropriate actions. Appropriate action includes the notification of the spill to the 24-hour Spill Report Line and INAC Water Resource Officer.
- Contain the spill or environmental hazard, as per its nature, and as per the advice of the Spill Line and INAC Water Resources Officer as required.

- Implement any necessary clean-up and/or remedial action.

9.2 Basic Steps – Chain of Command

- Immediately notify and report the 24-hour Spill Report Line at (867) 920-8130, the CIRNAC Water Resource Officer at (867) 975-4550, and Kivalliq Inuit Association at (867) 645-5731.
- A Spill Report Form is filled out as completely as possible before or after contacting the 24-hour Spill Report Line.
- Notify Miren Lorente and Paul Wozniak, GEM-GeoNorth Priority Manager and Science Project Officer respectively:
    - Miren Lorente: 343-597-0176 or miren.lorente@nrcan-rncan.gc.ca
    - Paul Wozniak: 403-461-7435 or paul.wozniak@nrcan-rncan.gc.ca

9.3 Other contacts for spill response/assistance and further reporting

Nunavut Water Board, Head Office Gjoa Haven	(867) 360-6338
Fisheries and Oceans Canada, Habitat Impact Biologist	(867) 979-8007
Government of Nunavut Emergency Health information	(867) 975-5910

10. Spill Equipment

Spill kits available at the airport can consist of:

- Heavy PVC tarp, impermeable to Jet B aviation and gasoline spills, sized in accordance with fuel containers.
- Aluminum stakes to secure impermeable tarp to ground.
- Particulate absorbent.
- Petroleum sorbent pads.
- PVC gloves.
- safety goggles.
- Disposable bags.
- Fire extinguisher per spill site.

A lab pack emergency portable spill kit will be available on the helicopter in case of emergency. This will consist of a lightweight drum made of high-density polyethylene with UV inhibitors and a screw top lid for easy opening in case of an emergency spill. Included in this emergency spill kit will be heavy weight absorbents, disposal bags, goggles, and gloves for safety.

11. Taking Action

11.1 Spill Response Actions for Jet B Aviation Fuel

Take action only if safety permits. Stop the source flow if safe to do so and eliminate all ignition sources. Never smoke when dealing with these types of spills.

On Land

Build a containment berm using soil material or snow and place a plastic tarp at the foot of the berm for easy capture of the spill after all vapours have dissipated.
Remove the spill by using absorbent pads or excavating the soil, gravel or snow.
Remove spill splashed on vegetation using particulate absorbent material.
Contact regulatory agencies for approval before commencing with the removal of any soil, gravel or vegetation.

On Muskeg
Do not deploy personnel and equipment on marsh and vegetation/;
Remove pooled gasoline or Jet B with sorbent pads and/or skimmer.
Flush with low pressure water to push toward collection point.
On advice from regulatory agencies, burn only in localized areas, e.g. trenches, piles or windrows.
Do not burn if root systems can be damaged (low water table).
Minimize damage caused by equipment and excavation.

On Water
Contain spill as close to release point as possible.
Use containment boom to capture spill for recovery after vapours have dissipated.
Use absorbent pads to capture smaller spills.
Use skimmer for larger spills.

On Snow and Ice
Build a containment berm around spill using snow.
Remove the spill using absorbent pads or particulate sorbent material/
The contaminated ice and snow must be scraped and shovelled into plastic buckets with lids, 205 litre drums, or polypropylene bags.

Storage and Transfer

All contaminated water, ice, snow, soil, and clean-up supplies will be stored in closed, labelled containers. All containers will be stored in a well-ventilated area away from incompatible materials.

Disposal

Any contaminated material will be shipped to an appropriate and approved disposal facility. The DOE monitors the movement of hazardous wastes from generators, carriers to receivers, through a tracking document (Waste Manifest). A waste manifest will accompany all movements.

12. Permits and Licences

The applicants are applying for all necessary Land Use and Scientific Research permits and licences. These include:

- Nunavut Research Institute
- Kivalliq Inuit Association Exemption certificate

13. Contacts

Project Proponents / Field Supervisors:

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