

# Archean supracrustal rocks on northern Baffin Island, Nunavut: defining the Mary River Group

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*Finnigan Award Recipient 2019*



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JOHNSTON



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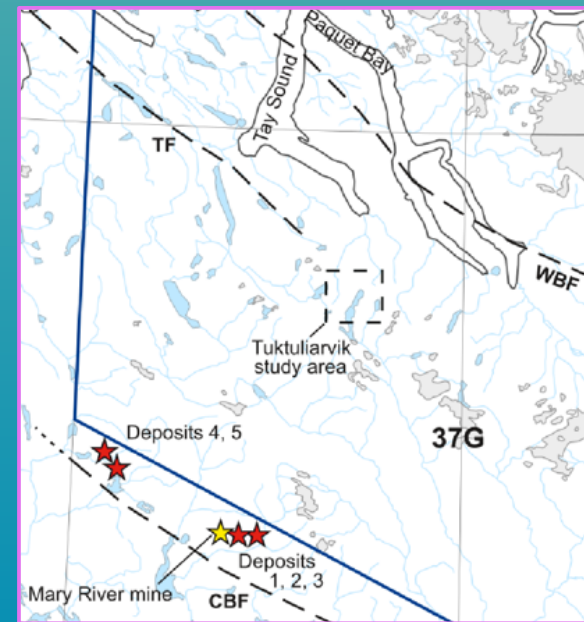
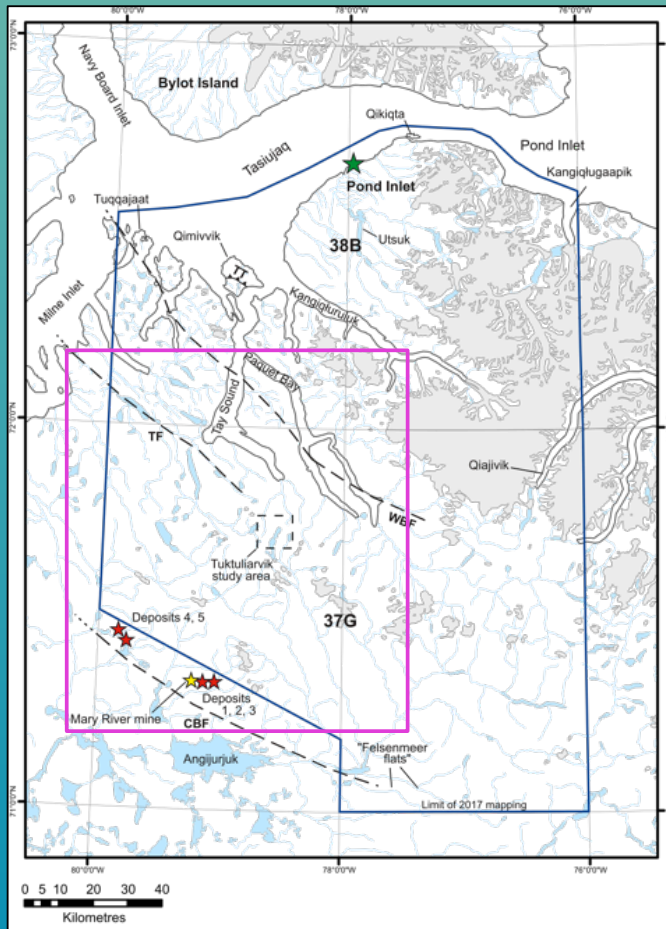
# OUTLINE

- GEMII North Baffin Project
- MSc Thesis Goals
- Regional Geology
- Long Lake
- Regional Considerations
- Next Steps



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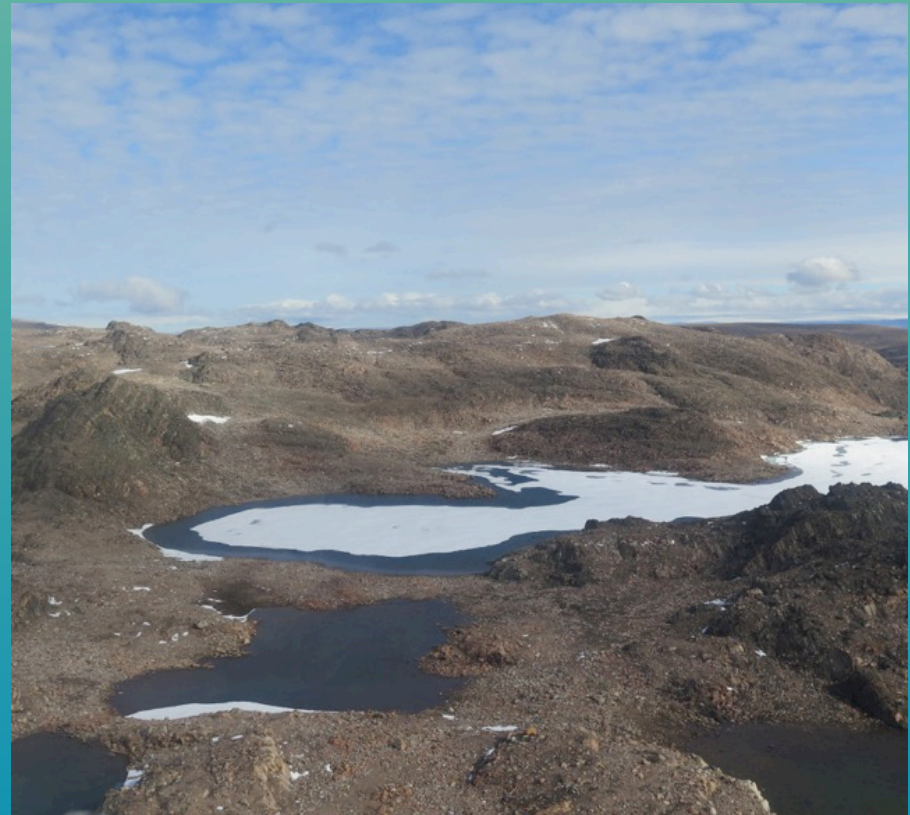
# LOCATION



From Skipton et al.,  
2017

# MSC GOALS

- GEOLOGICAL MAP
- OUTLINE STRATIGRAPHY
- STRUCTURAL SETTING
- BROAD DEPOSITIONAL AND TECTONIC ENVIRONMENT
- REGIONAL MRG CORRELATION
- NORTH BAFFIN GEOLOGICAL FRAMEWORK
- FURTHER EXPLORATION POTENTIAL



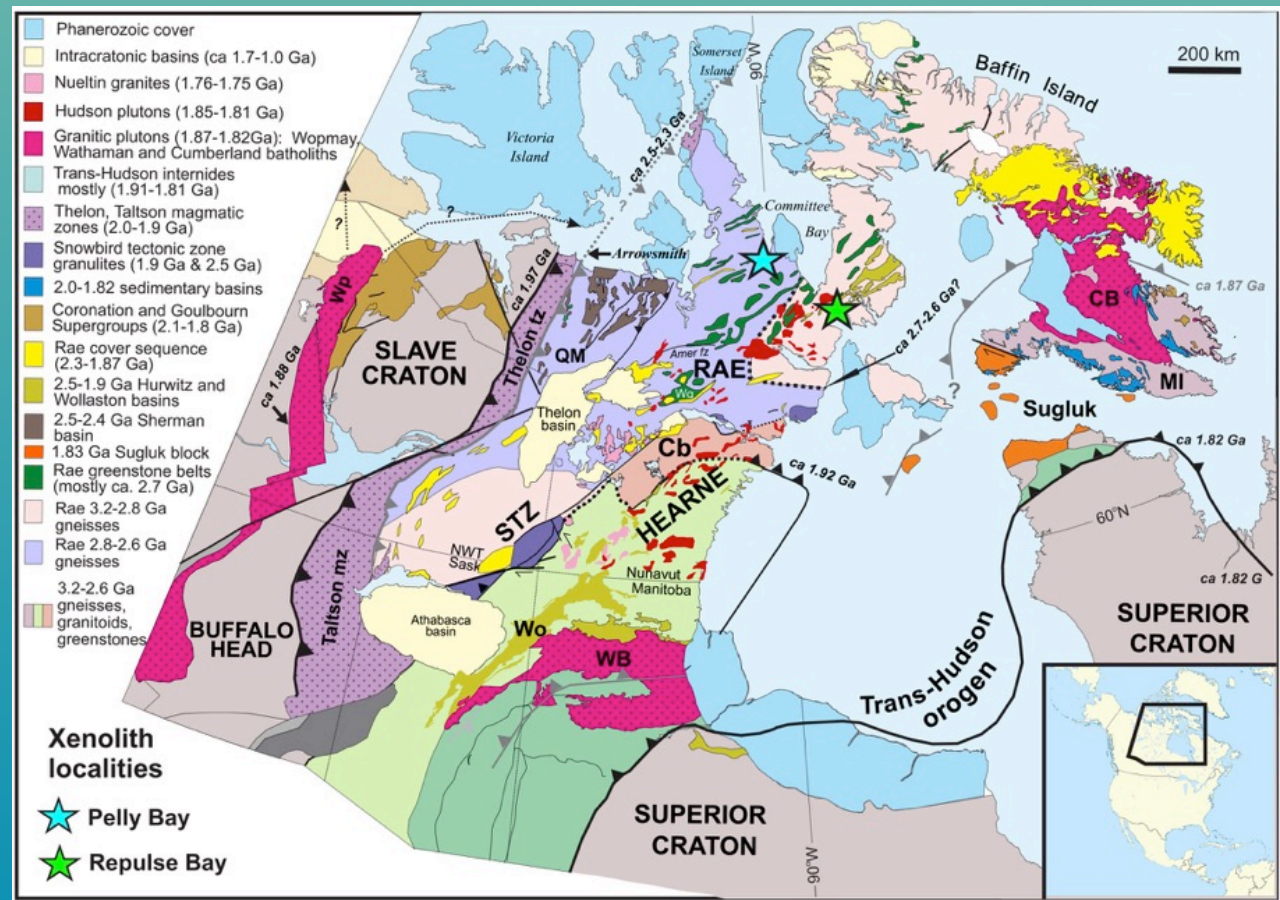
# REGIONAL GEOLOGY

## RAE CRATON

- Archean granite-greenstone terrain
- Greenschist to granulite facies
- Meso- to Neoproterozoic supracrustal rocks make up greenstone belts
- Northeast trending, elongate bodies
- Five major events of reworking and deformation (Jackson & Berman, 2005)

## NORTHERN BAFFIN ISLAND

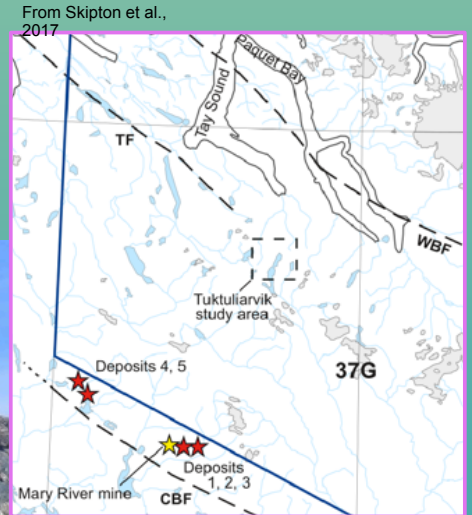
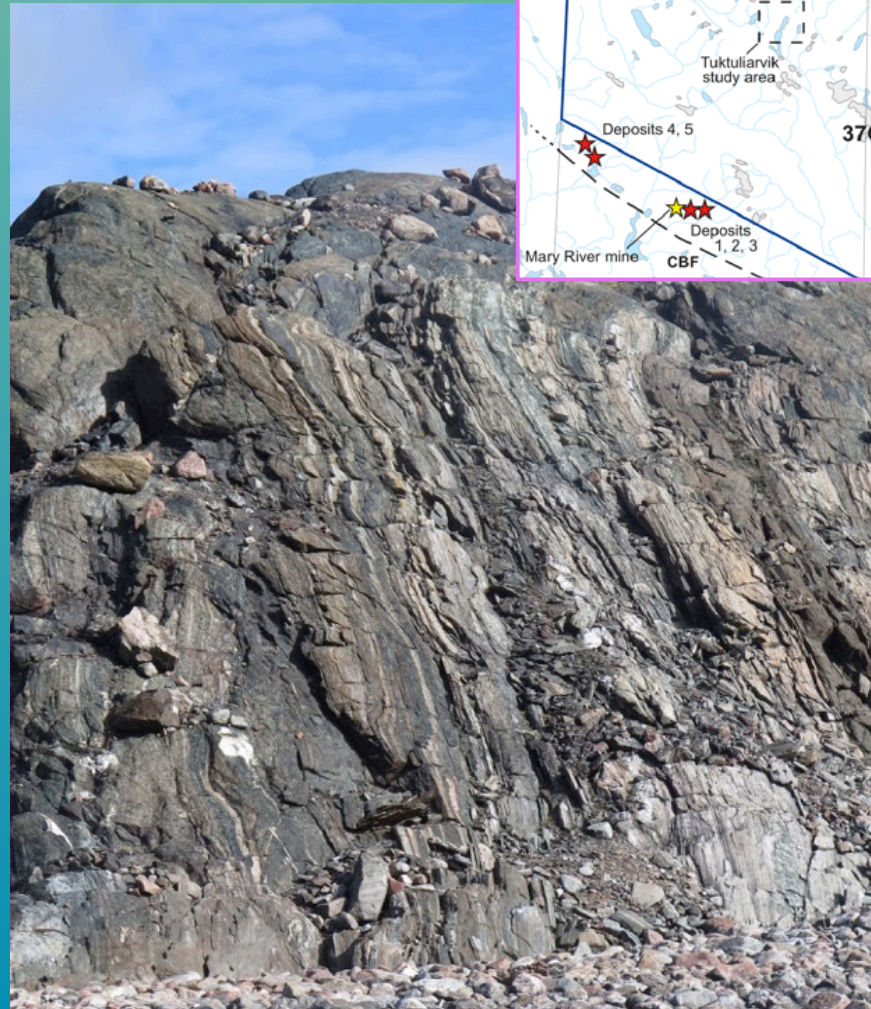
- Meso- to Neoproterozoic volcanic and sedimentary successions with banded iron formation, represented as the Mary River Group
- Surrounding Neoproterozoic felsic plutonic rocks and Mesoproterozoic basement gneiss
- Evidence for original unconformable relationship at Ege Bay (Bethune & Scammell, 2003a)



From Liu et al., 2016

# LONG LAKE

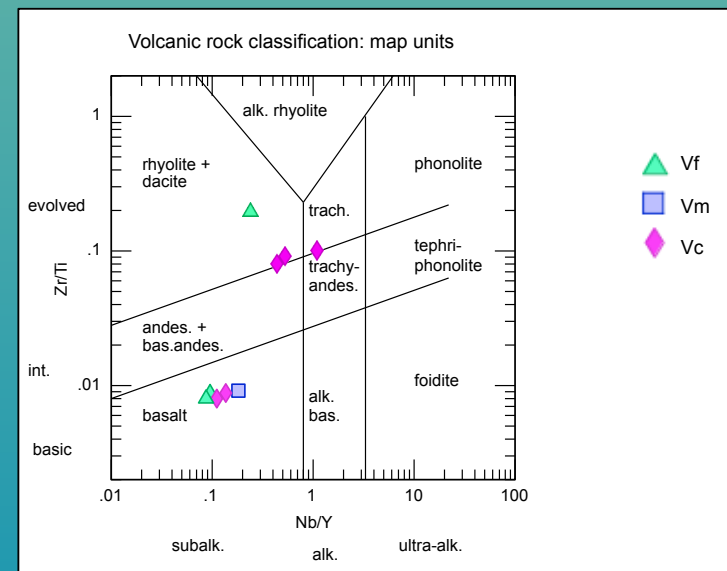
- Located western Tuktularvik region
- Well exposed metamorphosed sedimentary, volcanic and banded iron formation sequence
- No basement contact observed



# GEOCHEMISTRY

- *Very broad sample set*, nine metavolcanic rocks
- Two distinct sets: felsic and mafic
- Calc-alkaline, crustal
- Primitive, tholeiitic source

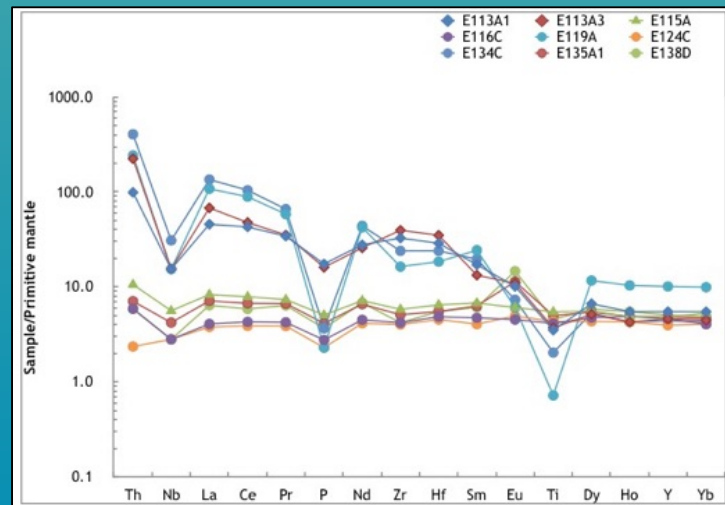
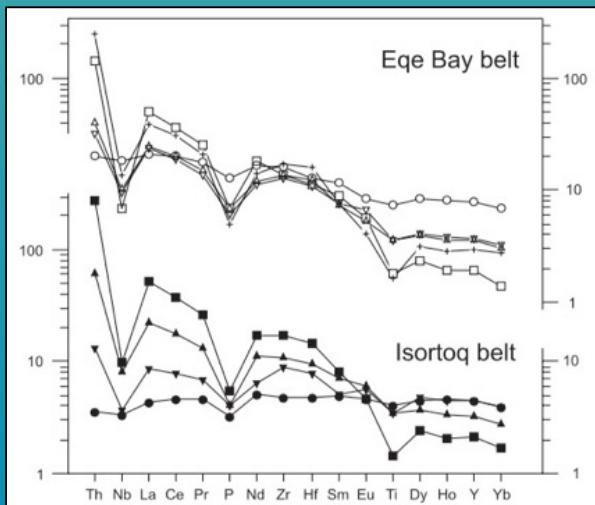
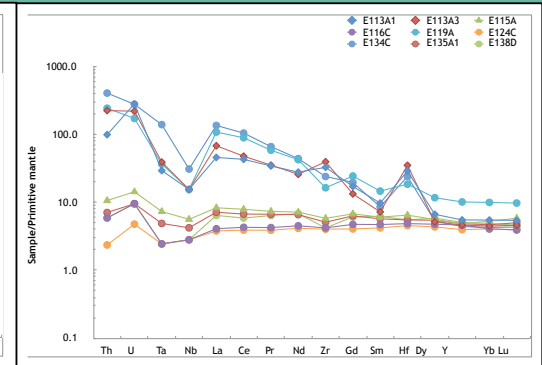
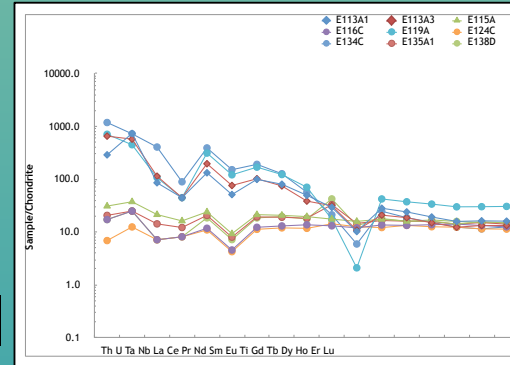
basalts



From Pearce, 1996

# GEOCHEMISTRY

- Nb signature
- Similarity to other MRG rocks
- Suggestive of a continental arc setting with oceanic source



- E113A1 rhyodacite
- E113A3 rhyodacite
- E115A basalt
- E116C basalt
- E119A rhyolite
- E124C basalt
- E134C trachy-andesite
- E135A1 basalt
- E138D basalt

From Pearce, 1996; Bethune & Scammell, 2003a



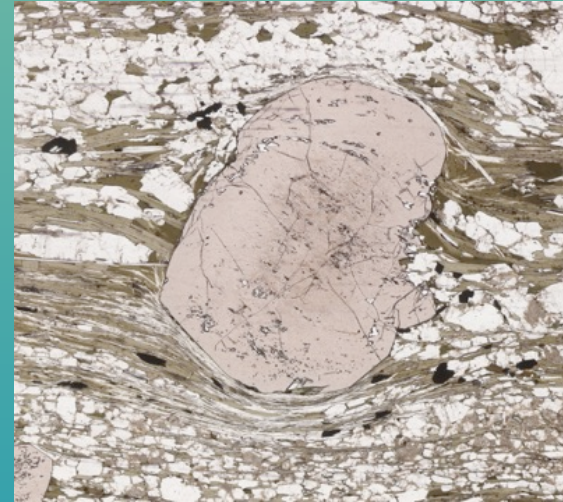
# STRUCTURE

- Layer parallel foliated, lineated, folded sequence
- Striking northeast, moderate plunge to the southeast
- Three generations folding (Young et al., 2004)



# METAMORPHISM

- Amphibolite facies
- Garnet and hornblende pseudomorphs syn- to post-deformation
- Evidence for earlier events too altered
- Last event (1.8-1.9 Ga) interpreted main metamorphic footprint



# MRG

# STRATIGRAPHY

- Lower and Upper MRG
- Developing continental volcanic arc, previously suggested by Gross (1980, 1983) and Jackson (2000)
- Multiple BIF occurrences, Superior and Algoma type suggest two different depositional environments
  1. Sedimentation and felsic volcanism (lower BIF)
  2. Mafic volcanism
  3. Sedimentation and intermediate to ultramafic volcanism (upper BIF)
  4. Sedimentation and felsic plutonism

# REGIONAL IMPLICATIONS

- Re-evaluation age supracrustal rocks of Mary River Group
- Interpreted unconformity between basement gneiss and supracrustal deposition
- Timing felsic plutonism syn to post-supracrustal deposition



# EXPLORATION IMPLICATIONS

- Too high grade for significant gold (Herbranson, 2013)

Meadowbank BIF-hosted gold, green schist to amphibolite facies,  
Woodburn Lake

Musselwhite BIF-hosted gold, structurally controlled F2 folds, amphibolite  
facies

- What can Archean Superior BIF mean?
- Bimodal volcanism...VMS?
- Geochemistry of felsic intrusions



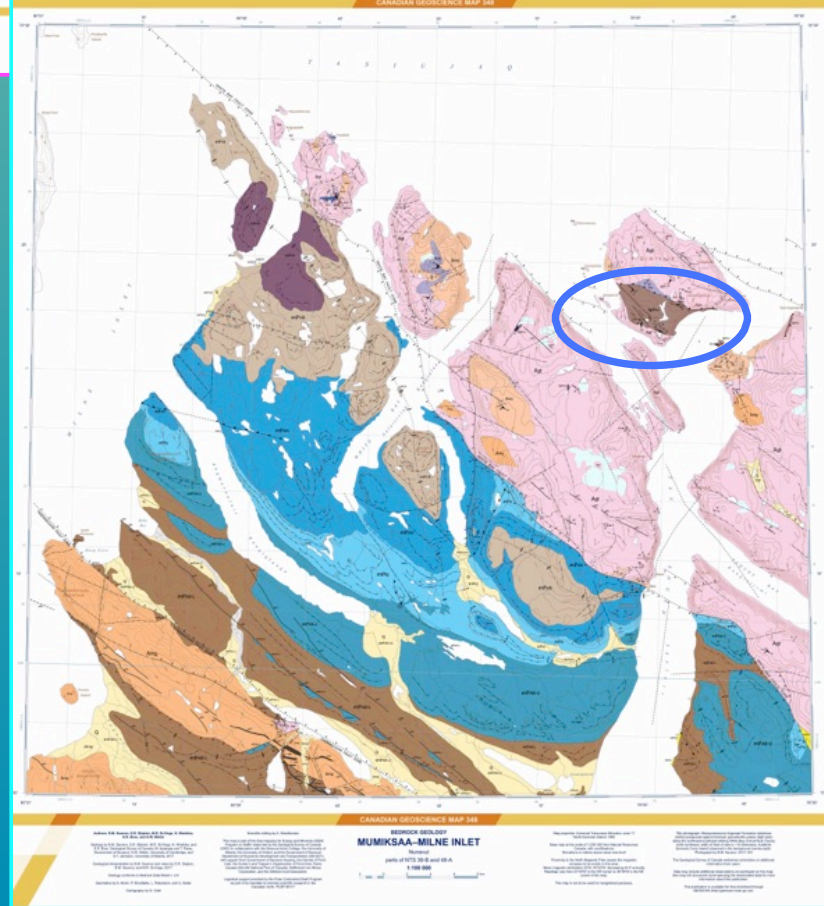
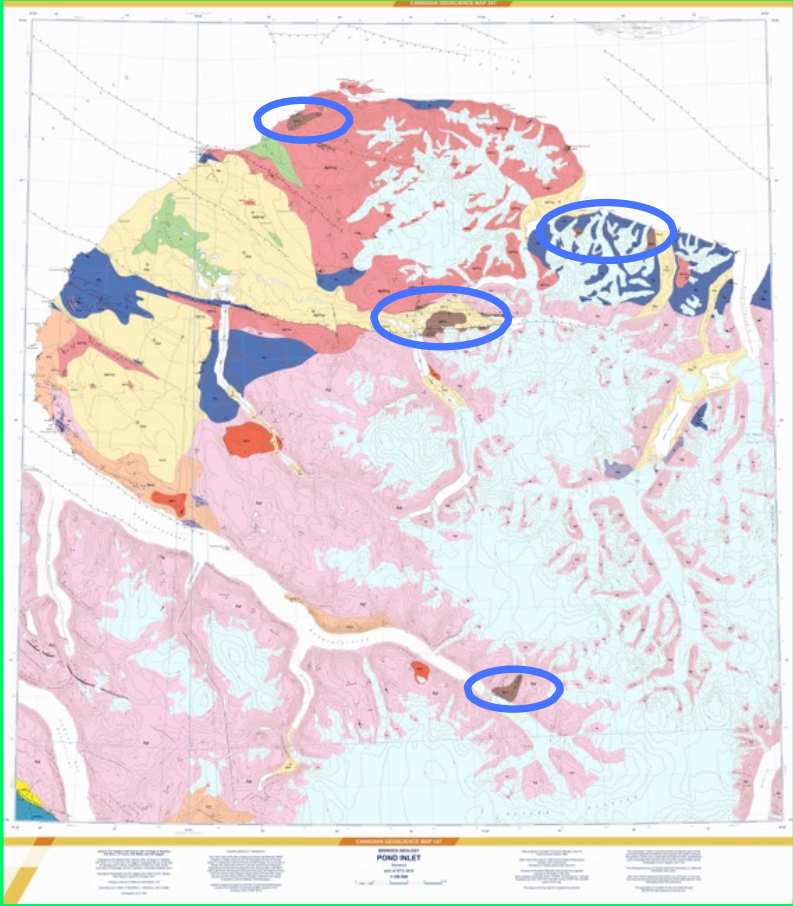
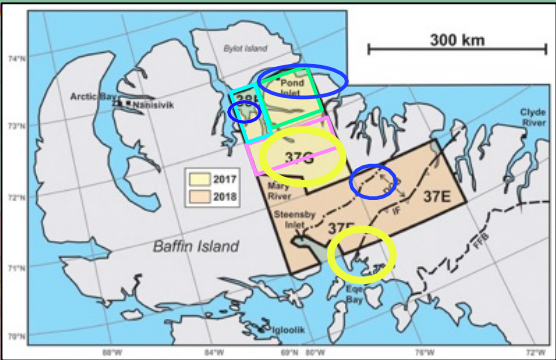
# NEXT STEPS

- Geochemistry on metasedimentary rocks, BIF
- Archean deformation evidence?
- Correlation to units around Pond Inlet and Barnes Ice Cap



Known

Prospective



# THANK YOU NAKURMIK QUJANNAMIK



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