



Industrial Limestone (carbonate) Resources, Southampton Island

— An assessment



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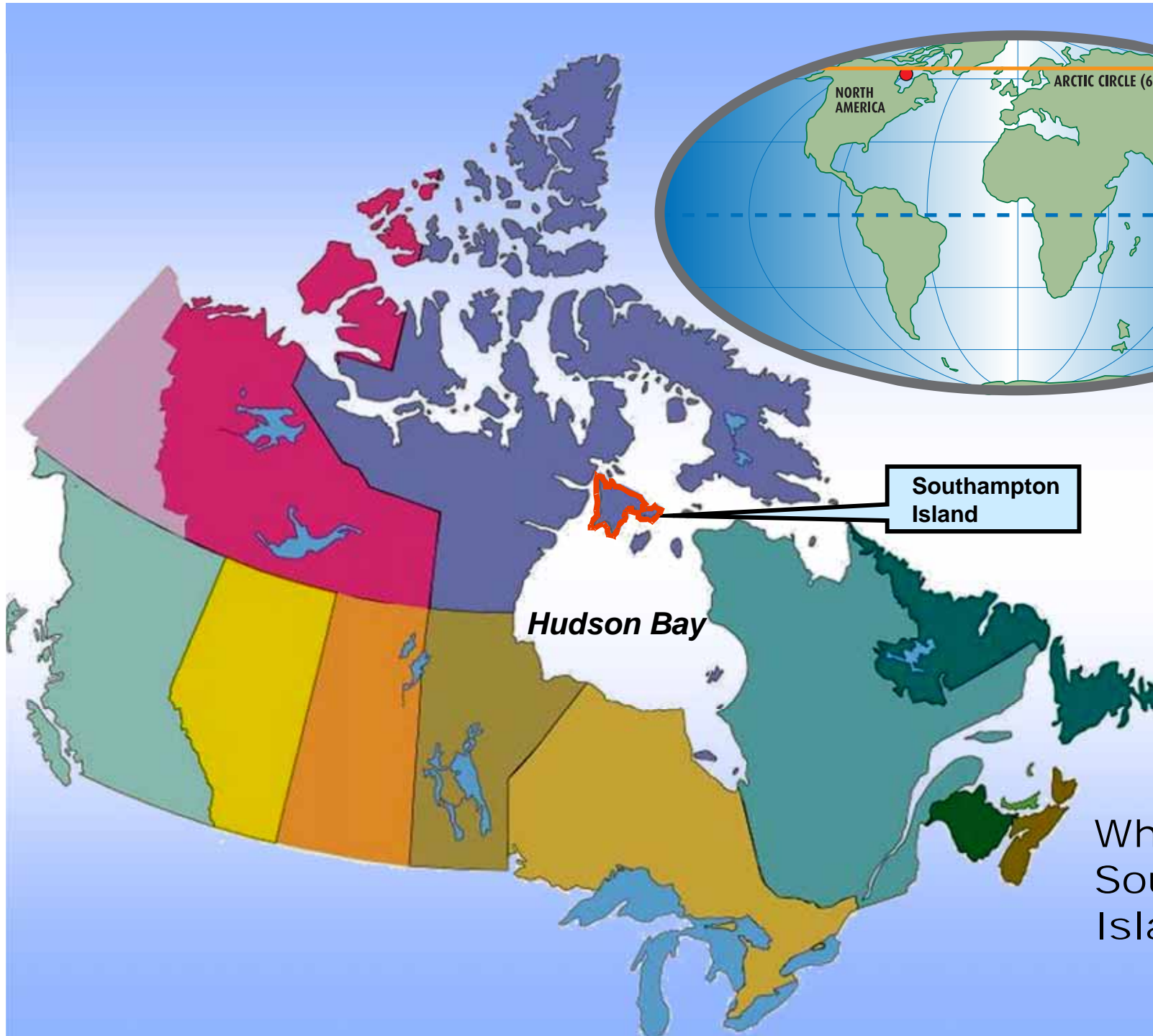
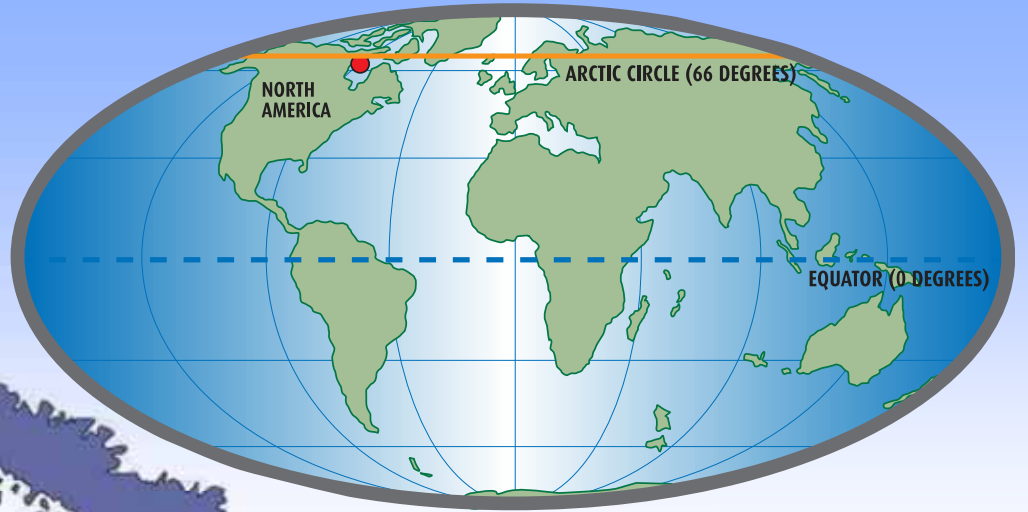


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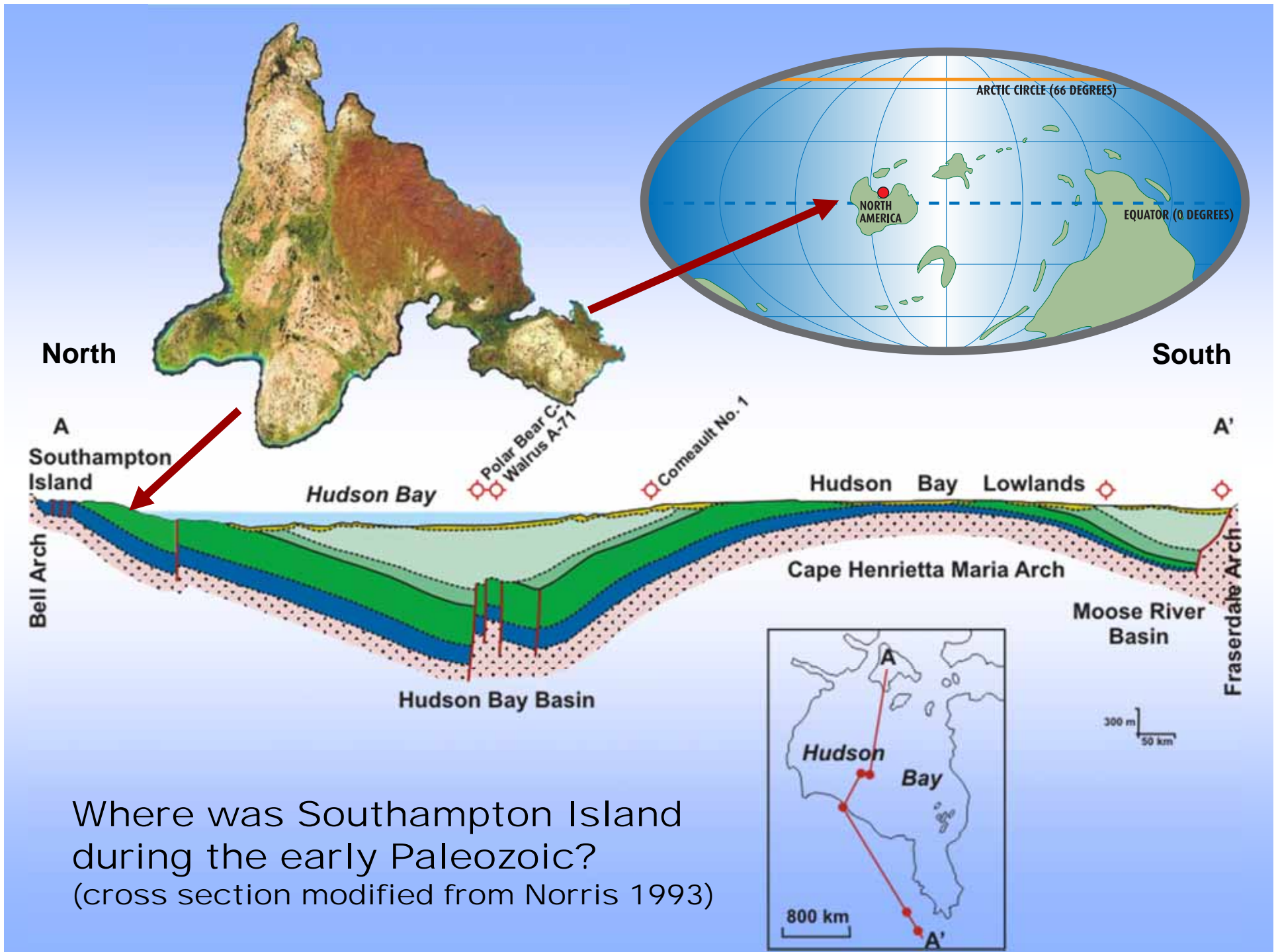
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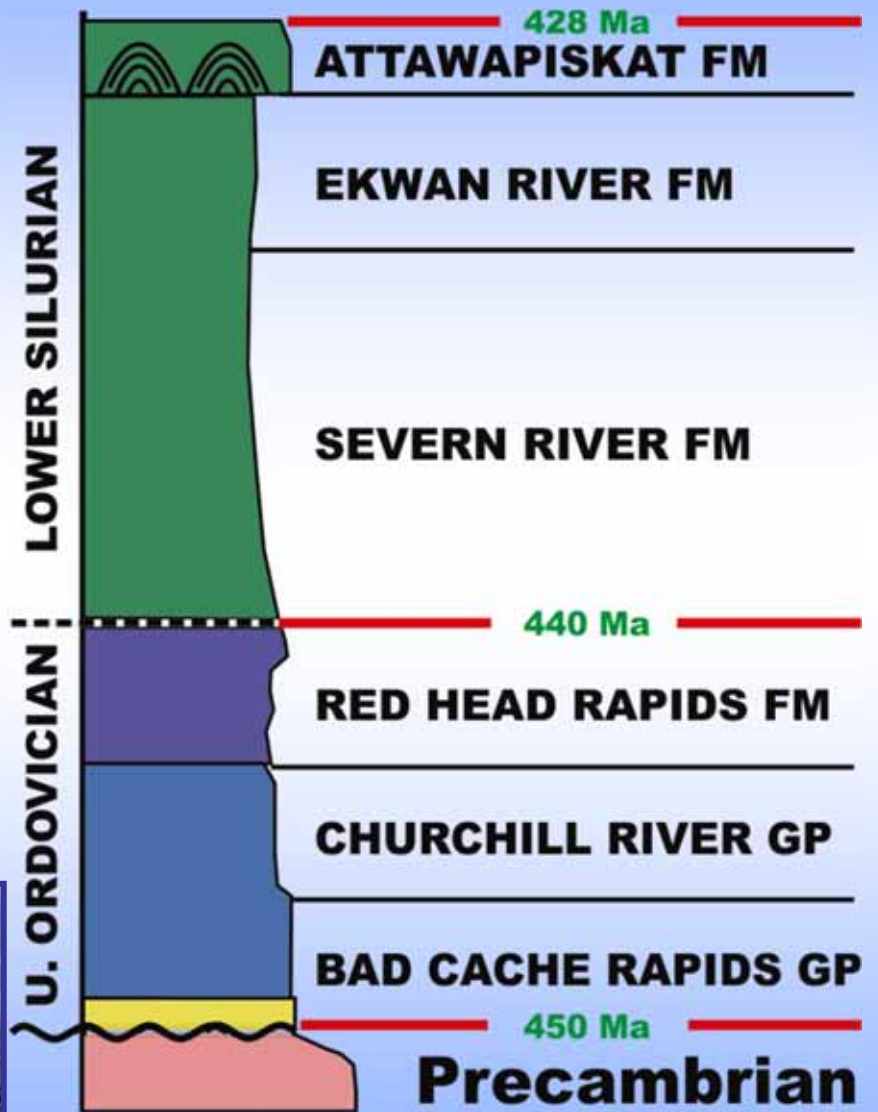
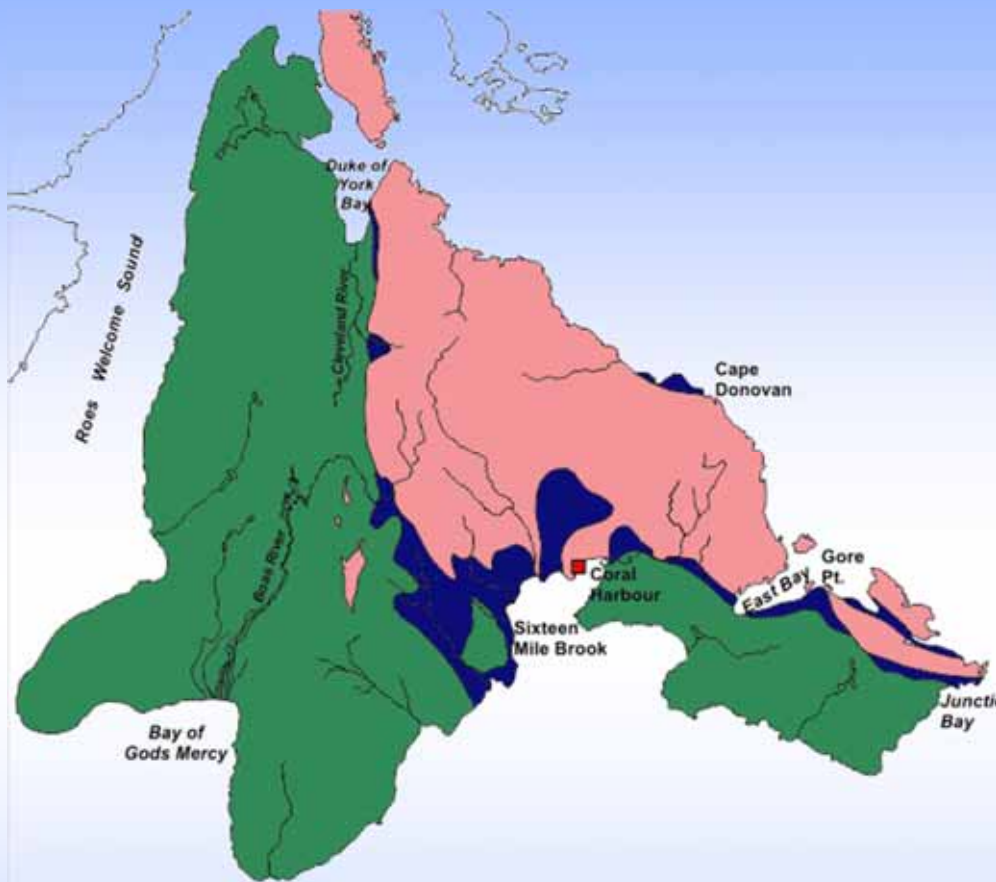
Southampton Island

Hudson Bay

Where is Southampton Island today ?



Where was Southampton Island during the early Paleozoic?
 (cross section modified from Norris 1993)



Upper Ordovician on Southampton Island



Sixteen Mile Brook

Red Head Rapids Fm
Orange-tan dolostone &
argillaceous dolomitic limestone

Churchill
River Gp

Greenish grey
argillaceous
dolomitic
limestone



East of Rocky Brook

Relatively
pure unit



Bad Cache
Rapids Gp

Grey/dark grey
limestone

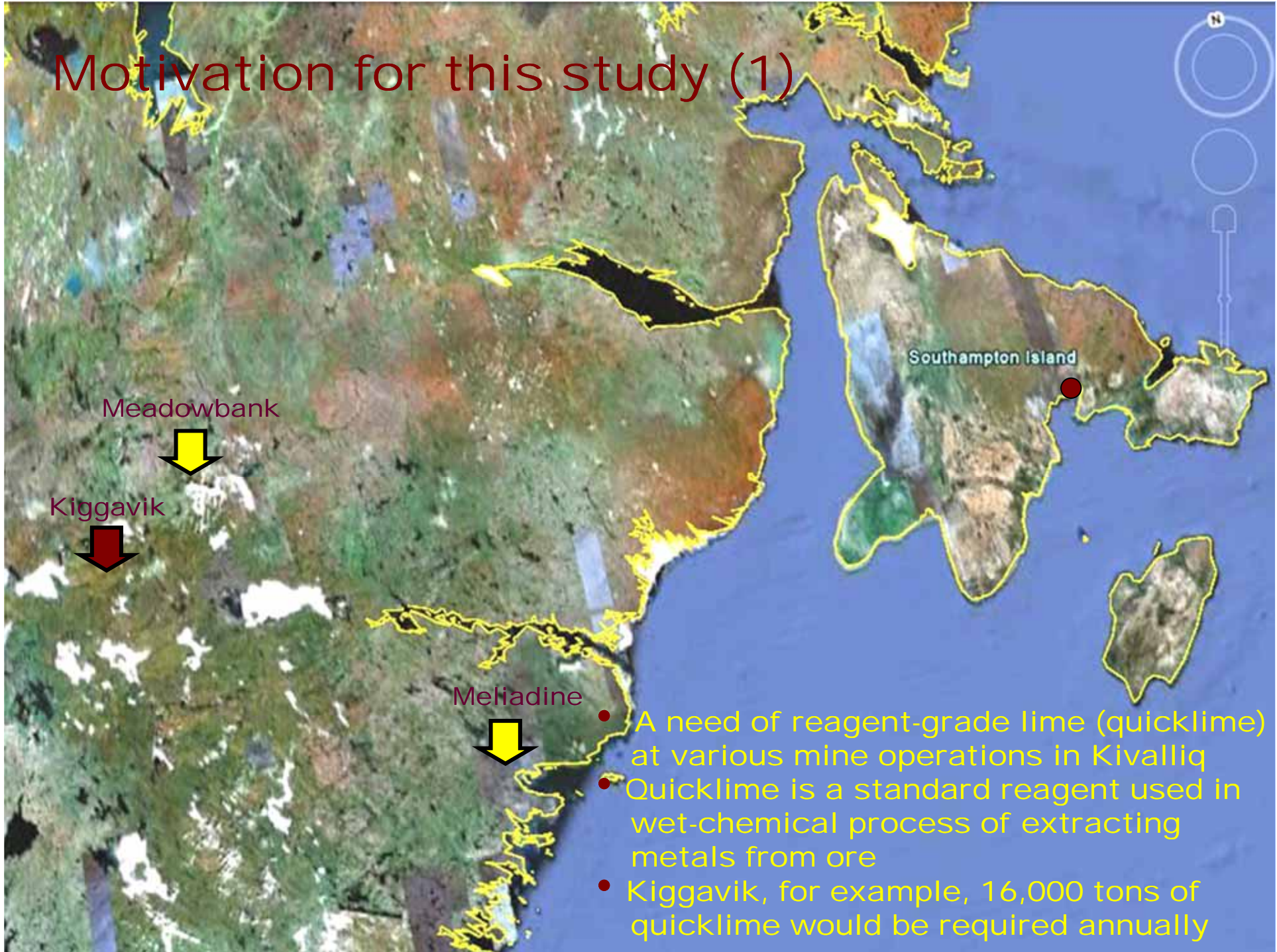


Rocky Brook



- ❑ Why we initiated a project to study the limestones on Southampton Island?
- ❑ Why we studied the Bad Cache Rapids limestones near Coral Harbour?

Motivation for this study (1)



- A need of reagent-grade lime (quicklime) at various mine operations in Kivalliq
- Quicklime is a standard reagent used in wet-chemical process of extracting metals from ore
- Kiggavik, for example, 16,000 tons of quicklime would be required annually

Motivation for this study (2)





In 2009, Canada-Nunavut Geoscience Office proposed a research project –

Industrial Limestone Resources on Southampton Island

- ❖ Better understand the stratigraphy and distribution of the Bad Cache Rapids Group.
- ❖ Provide an assessment of limestone purity based on detailed geochemical (both mineral and chemical) and petrographical data.
- ❖ Identify potential quarry locations based on thickness and lateral continuity, if the limestone meets the standards for industrial use.



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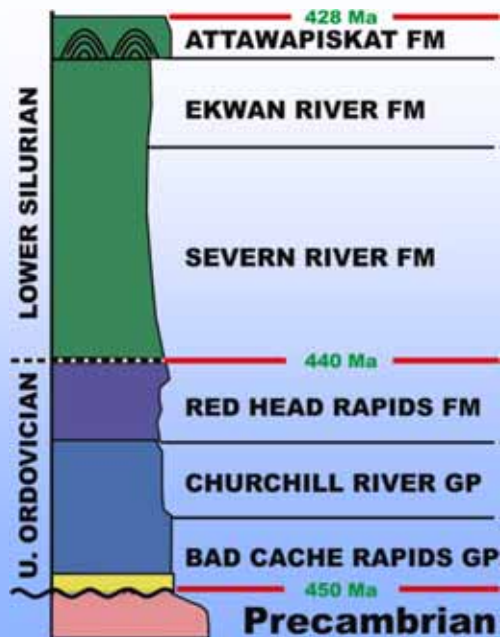
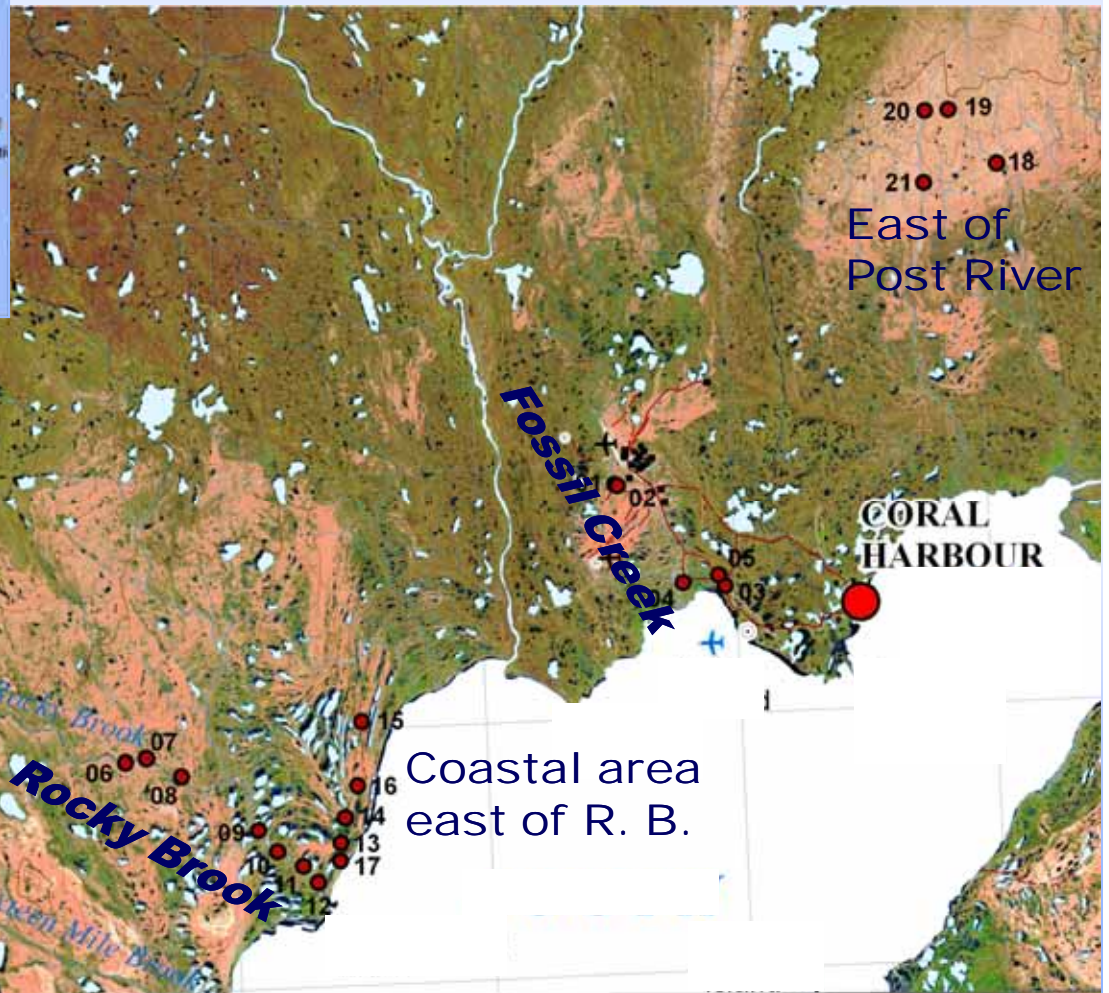
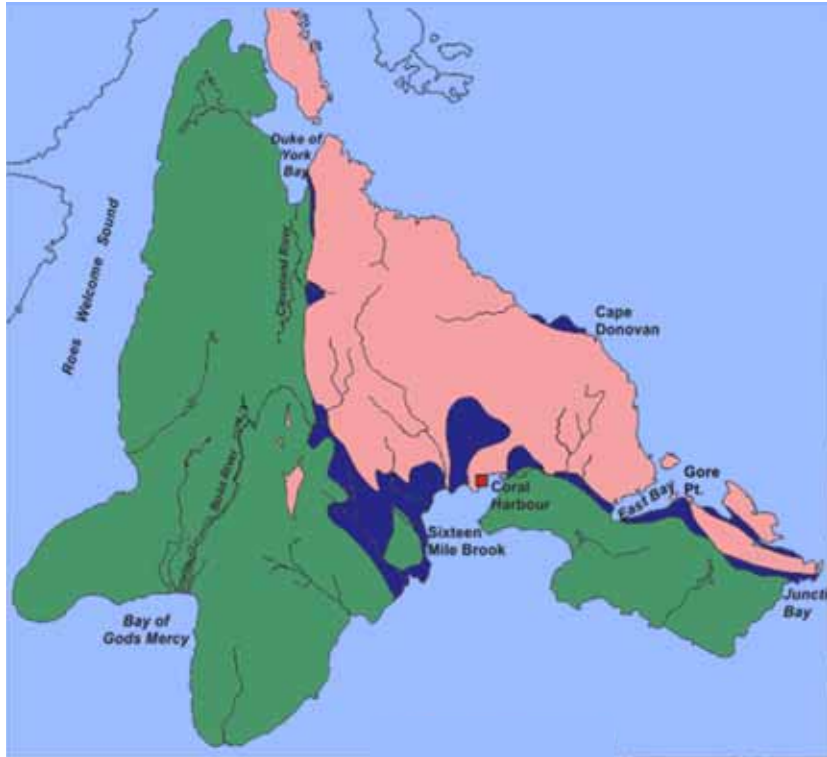


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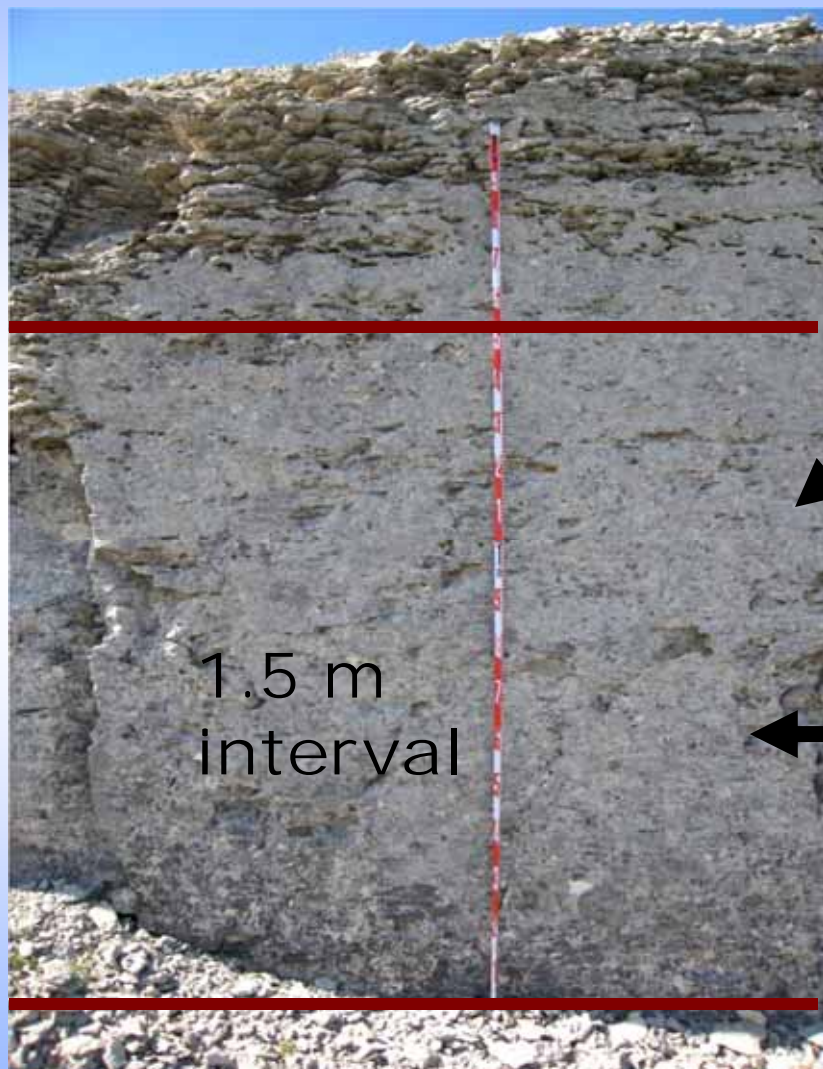
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Sample locations of Bad Cache Rapids Group limestone

- 1) Rocky Brook
- 2) Coastal area east of Rocky Brook
- 3) Fossil Creek
- 4) East of Post River.



What kinds of samples were collected?



Representative hand sample for thin section (petrographic) study from any spot within 1.5 m interval



3 kg chip sample covering 1.5 m interval for geochemical analysis (XRD & XRF)

❖ A total of 44 sets of samples were collected from 4 different locations around Coral Harbour

❖ Two complimentary analytical methods applied to 44 samples

- X-Ray Diffraction (XRD):
percentage of minerals in the rocks
CaCO₃ range: 84.6-98%
average CaCO₃: 92.4%
- X-Ray Fluorescence (XRF):
percentage of oxides in the rocks
CaO range: 44.73-53.56%
average CaO: 50.4%

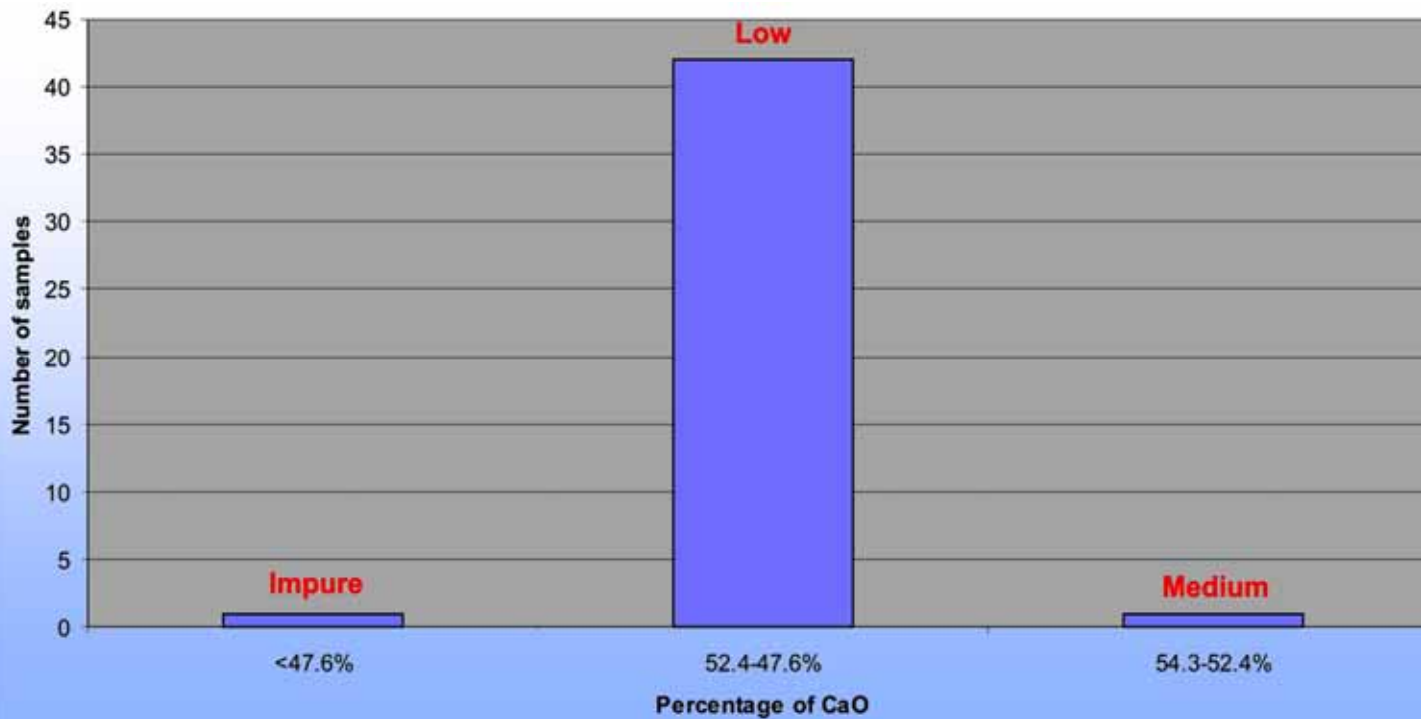
How to evaluate the limestone near Coral Harbour?

**British Geological Survey Scheme for the Classification of Limestone by purity
(after Harrison, 1992)**

No	Percentage of		Category
	CaCO ₃	Equivalent CaO	
1	> 98.5	> 55.2	Very high purity
2	98.5 - 97.0	55.2 - 54.3	High purity
3	97.0 - 93.5	54.3 - 52.4	Medium purity
4	93.5 - 85.0	52.4 - 47.6	Low purity
5	< 85.0	< 47.6	Impure

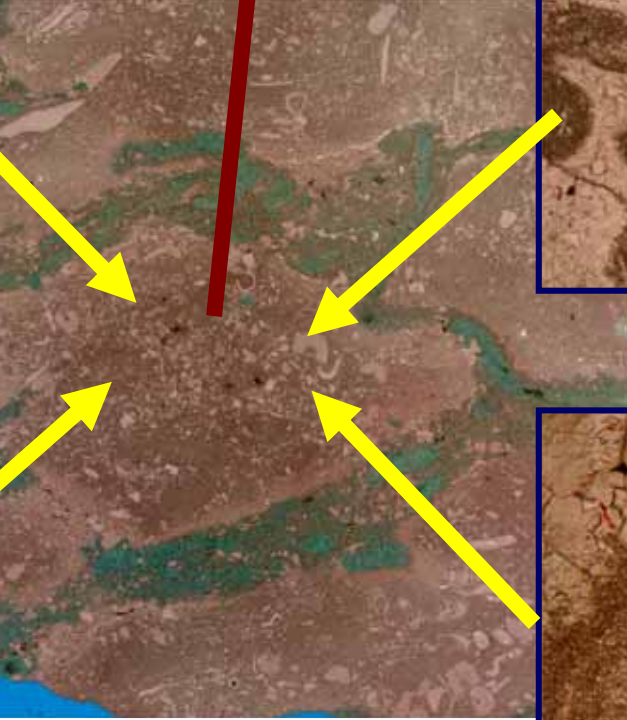
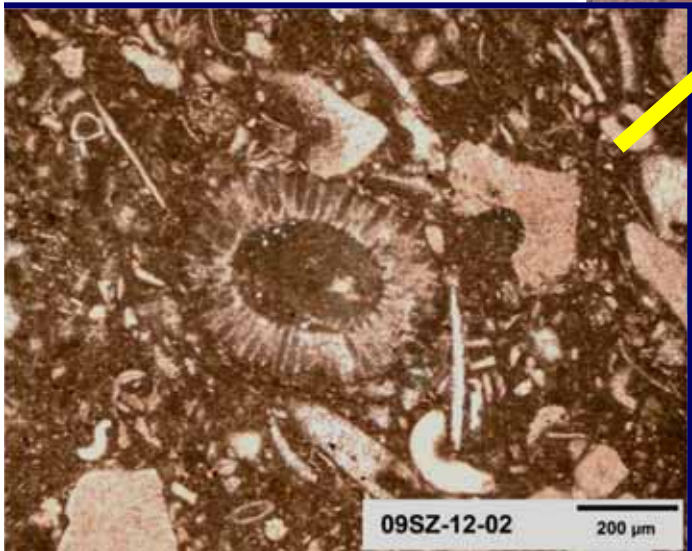
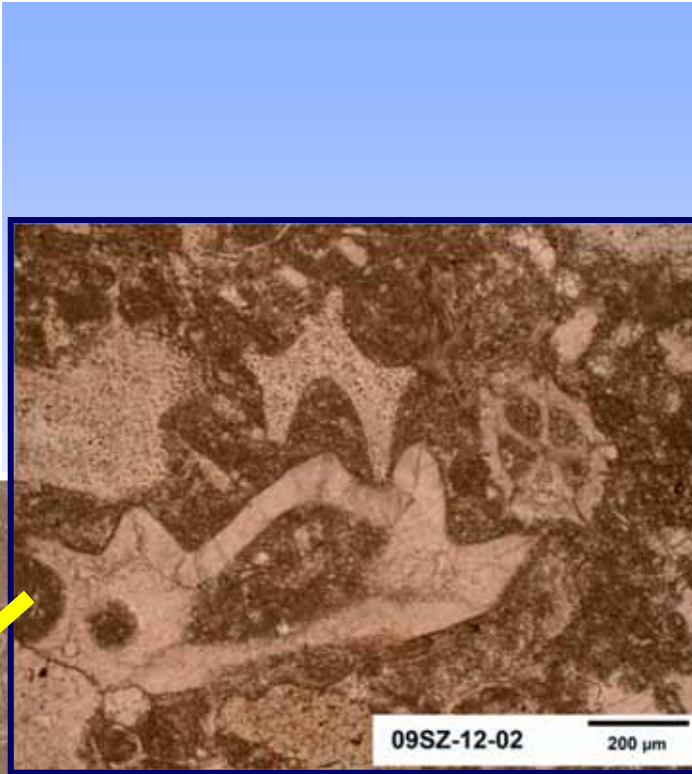
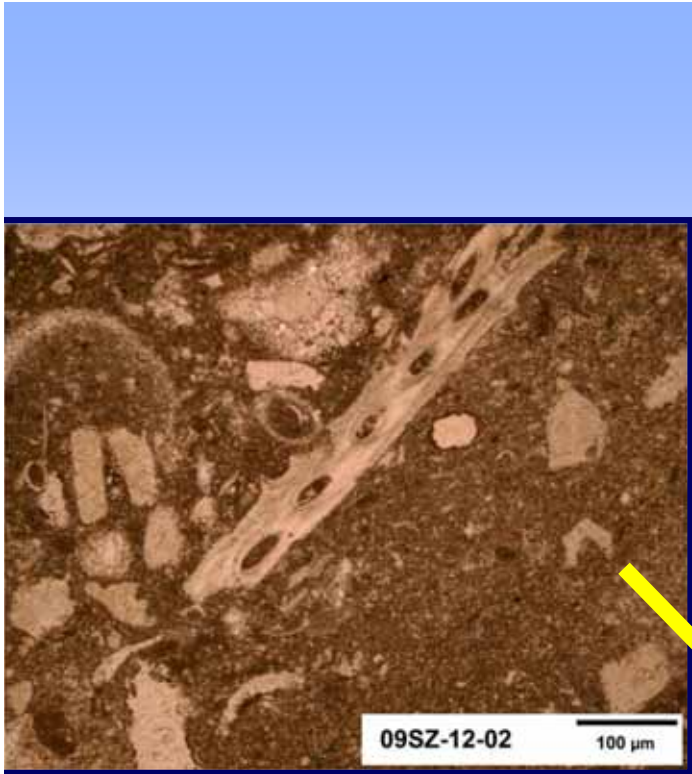
Classification of limestone by purity (after Harrison, 1993) and grade of limestone on Southampton Island based on data (CaO) collected by XRF

No	Percentage of		Category	Limestone on Southampton Island (number of samples)
	CaCO ₃	Equivalent CaO		
1	> 98.5	> 55.2	Very high purity	0% (0/44)
2	98.5 - 97.0	55.2 - 54.3	High purity	0% (0/44)
3	97.0 - 93.5	54.3 - 52.4	Medium purity	2.3% (1/44)
4	93.5 - 85.0	52.4 - 47.6	Low purity	95% (42/44)
5	< 85.0	< 47.6	Impure	2.3% (1/44)

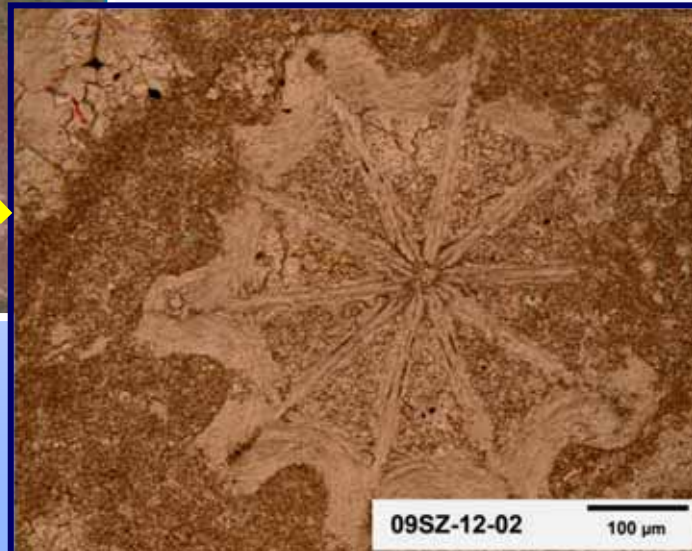




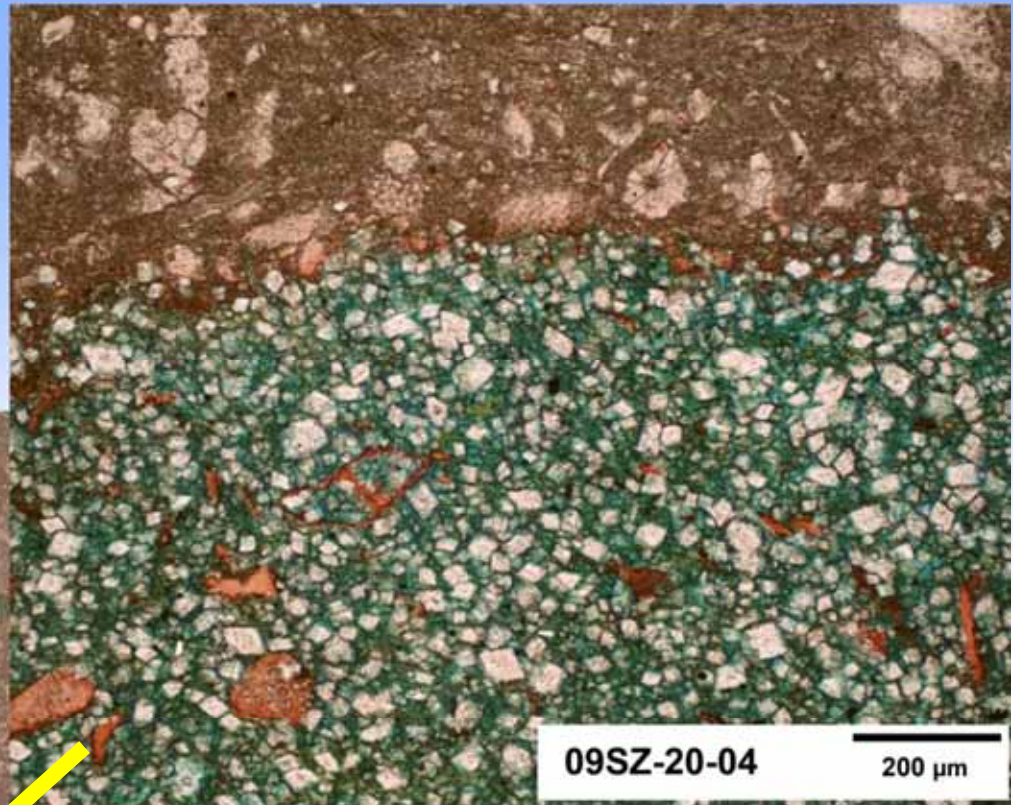
The large proportion of the rock consists of calcite (CaCO_3 ; grey color); the irregular zones with yellowish orange color on the surface are composed of dolomite [$\text{MgCa}(\text{CO}_3)_2$].



Higher purity limestone fraction under the microscope



Dolomite fraction under the microscope



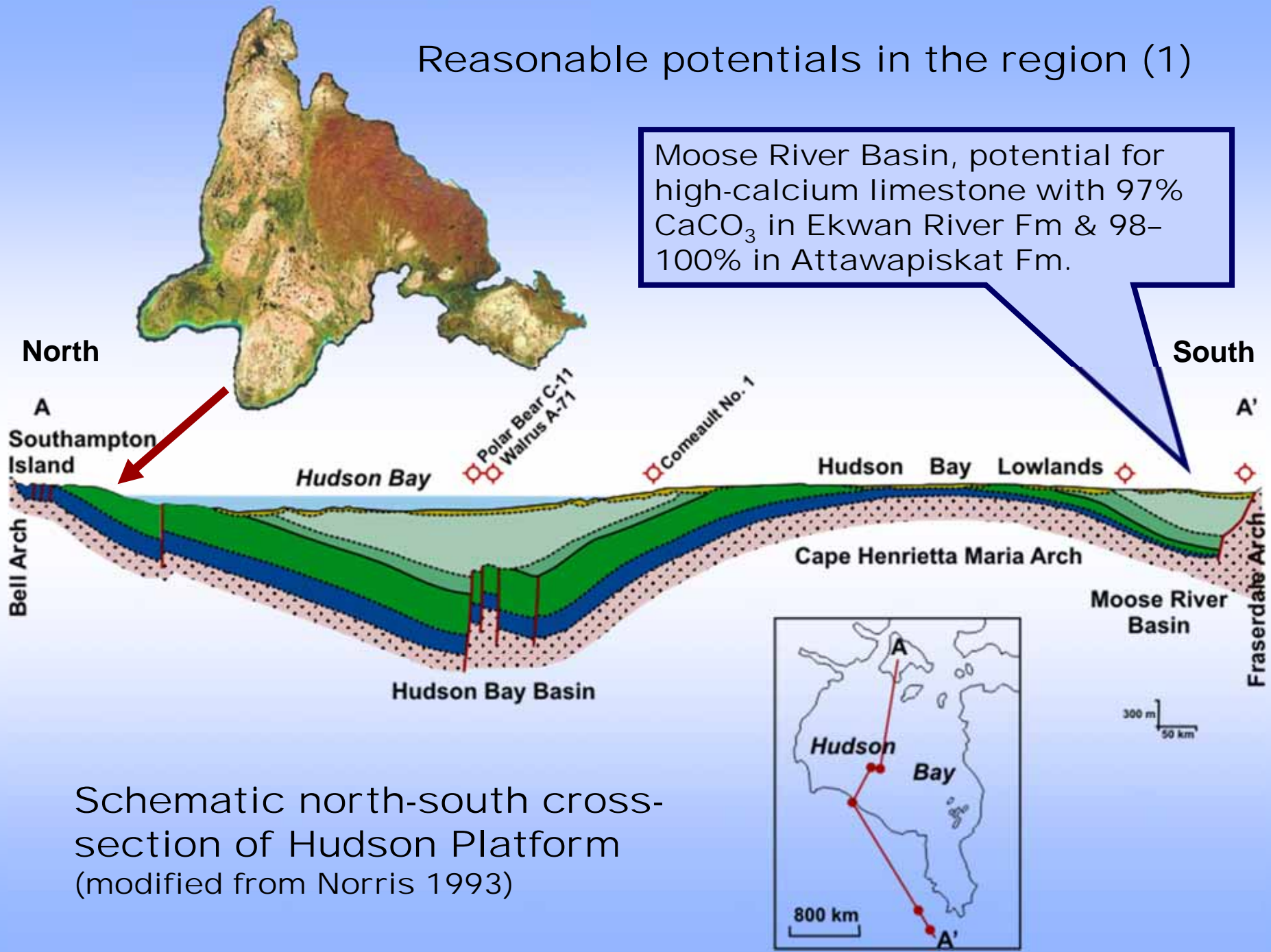
Multiple analytical and petrographical techniques were employed in this project:

- ❑ X-Ray Fluorescence (XRF)
- ❑ X-Ray Diffraction (XRD)
- ❑ Petrography

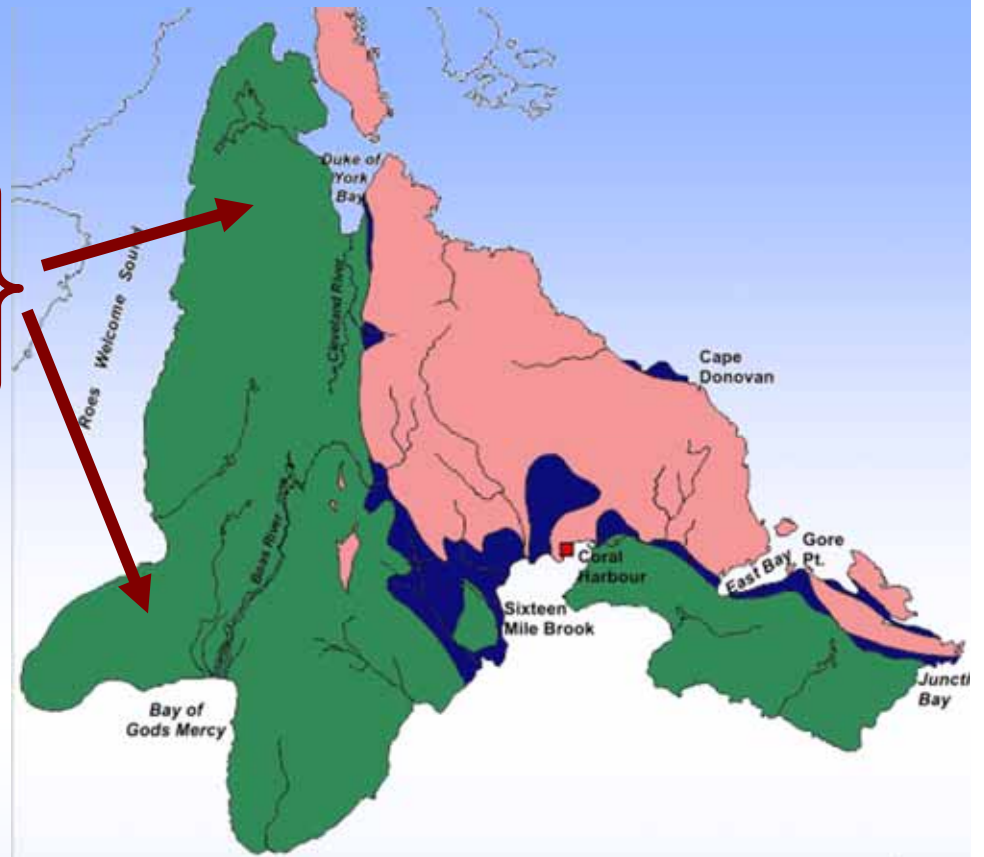
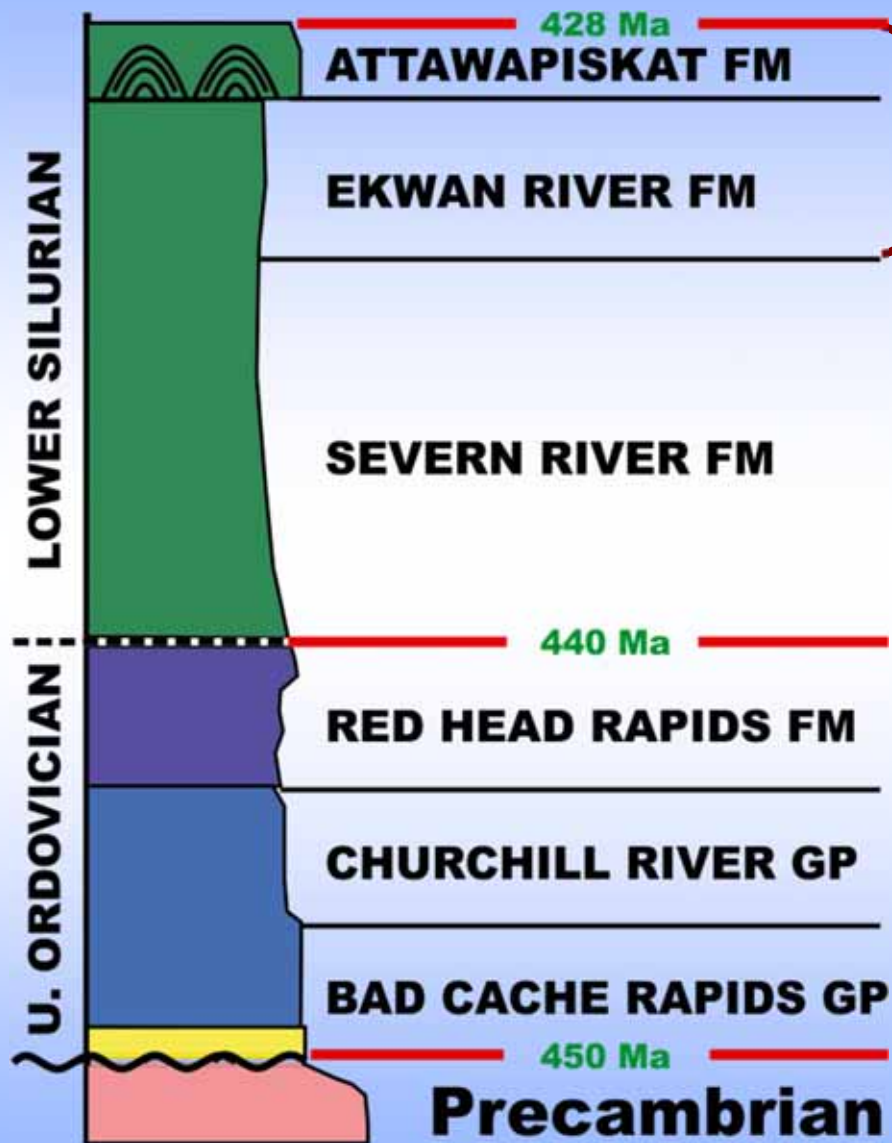
Overall, the limestones around Coral Harbour (Bad Cache Rapids and lower Churchill River groups) predominantly demonstrate chemical-industrial purity value of “Low Purity”; therefore, they do not meet the standards for most industrial uses.

Reasonable potentials in the region (1)

Moose River Basin, potential for high-calcium limestone with 97% CaCO_3 in Ekwan River Fm & 98-100% in Attawapiskat Fm.

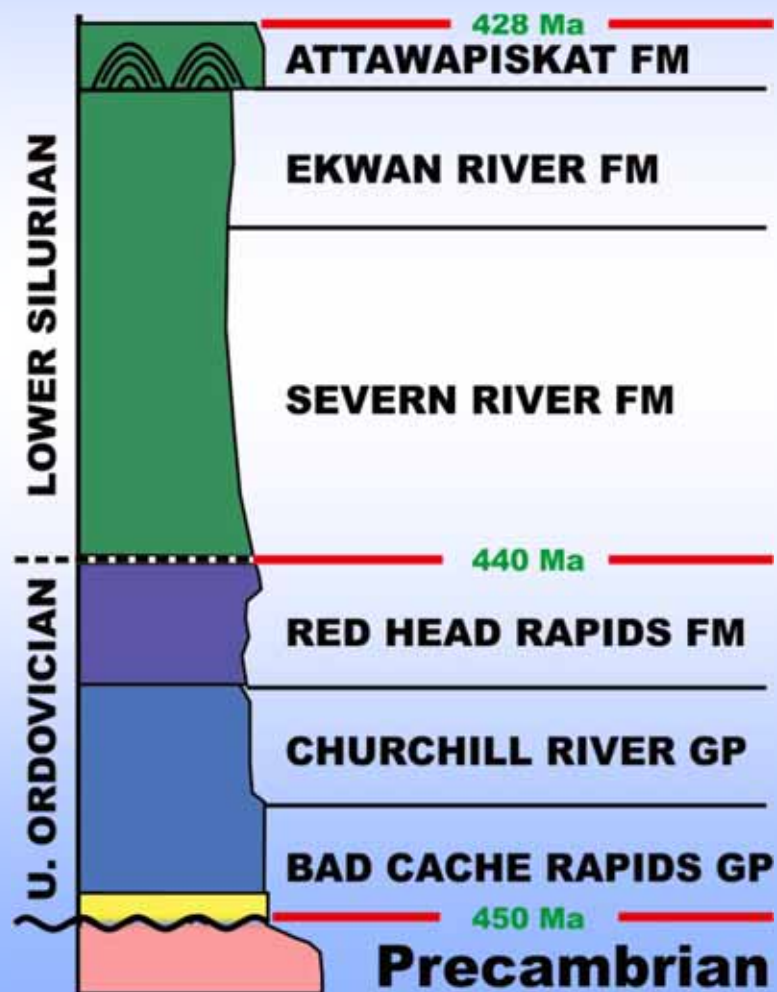


Schematic north-south cross-section of Hudson Platform (modified from Norris 1993)



Stratigraphically moving upwards to test limestone of Ekwon River Fm and Attawapiskat Fm on Southampton Island

Reasonable potentials in the region (2)



Geographically expanding the study to areas on eastern Melville Peninsula & southern Baffin Island, where Bad Cache Rapids Group equivalent limestones are exposed.



**GEOLOGICAL SURVEY OF CANADA
OPEN FILE 6827**

**An Assessment of a Potential Source of Industrial Limestone
on Southampton Island, Nunavut**

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