Canada
Department of Energy, Mines and Resources
Geological Survey of Canada

LEGEND

COPPERMINE RIVER GROUP

10 COPPER CREEK FORMATION: basalt flows, minor sandstone

DISMAL LAKES GROUP

9 Dolomite, undivided

8 Sandstone, intercalated black shale

C MUSKOX INTRUSION COMPLEX

HORNBY BAY GROUP

7 Sandstone, minor conglomerate

6 Sandstone, siltstone, shale

5 Dolomite

4 Sandstone, minor conglomerate

GREAT BEAR BATHOLITH

3 Granodiorite, quartz monzonite, granite

2 Volcanic flows and tuffs, sedimentary rocks, felsite intrusions undivided

1 METAMORPHOSED EPWORTH GROUP ROCKS

HEPBURN METAMORPHIC-PLUTONIC BELT

B Gneiss, migmatite

A Granitic rocks

Drift-cover
Geological boundary
Limit of geochemical survey
Fault

Geology derived from:

B.G. Craig, W.L. Davison, J.A. Fraser, R.J. Fulton, W.W. Heywood, T.N. Irvine, 1959, G.S.C. map 18-1960

C.H. Smith, T.N. Irvine, D.C. Finlay, 1963 G.S.C. maps 1213A and 1214A

W.R.A Baragar and J.A. Donaldson, 1969, G.S.C. maps 1337A and 1338A

P.F. Hoffman, I.R. Bell and R. Tirrul, 1975, in G.S.C. Paper 76-1A, pg 354

J.C. McGlynn, 1976, Bear and Slave Provinces, compilation map, in preparation

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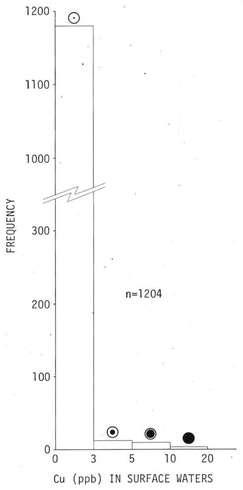
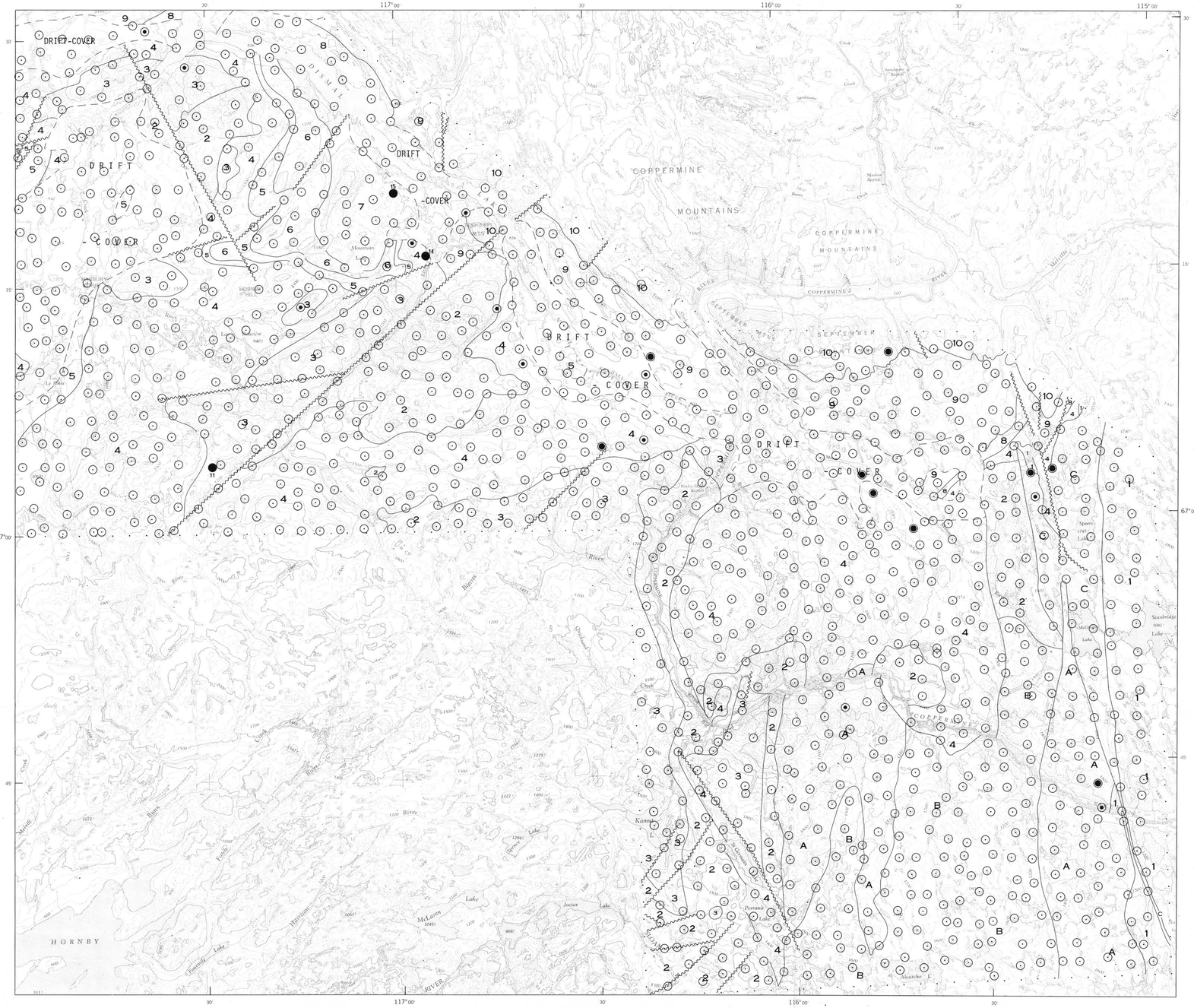
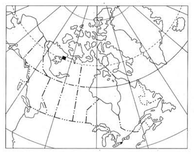
by
C.C. Durham
Geological Survey of Canada






INDEX MAP

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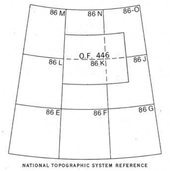
COPPER IN SURFACE WATERS

HORNBY BASIN, DISTRICT OF MACKENZIE, N.W.T. 1975

Scale 1:250,000

Kilometres 6 0 6 12 18 Kilometres
Miles 4 0 4 8 Miles

Universal Transverse Mercator Projection



MARGINAL NOTES

An orientation survey was conducted in June 1975 to study the feasibility and technology of applying hydrogeochemical methods for uranium in Proterozoic sandstone terrane and to test new rapid methods of field collection. From June 15 to June 27, 1975 surface water was collected from lakes, mainly, and some streams and bogs, over a 6600 km^2 area in the Hornby Basin area of the Northwest Territories. The map includes parts of N.T.S. map sheets 86J, K, N and O. The primary objective was to investigate if a hydrogeochemical reconnaissance-level survey could outline uranium targets. There are reported occurrences of uranium in the St. Germain Lake area and near Mountain Lake, south of Dismal Lakes. The survey area covered a geological series in which there is uranium potential for primary mineralization in the Great Bear Batholith, secondary mineralization near the sub-Helikian unconformity and roll-type mineralization in the continental sediments. The survey area was also extended to include the base metal occurrences of the Muskox Intrusion. The area underlain by the Coppermine basalts was not sampled. These copper-rich basalts were studied by Hornbrook and Allan (1969) and Allan et al (1970).

The surficial geology has been described by Craig (1960). Ice flow direction was generally from the southeast to the northwest. Glacial drift covers broad areas of bedrock along the northern boundary of the map area and in the western part from Lac La Roux north to Dismal Lakes.

In many of the larger lakes (>3 km^2) heavy ice conditions prevailed. The effect of the melt water on the surface sample collected from open leads or at the shoreline, was probably a serious dilution factor (MacDonald 1969). As a result the outline of some anomalies could have been missed and severely weakened others.

Sampling Method:

500 ml. of surface water were collected at each site using an automated, helicopter-mounted system described earlier by Cameron and Durham (1975). The system is designed to sample lake waters as rapidly as possible and at the same time to measure pH, conductivity and temperature. This was the first test of the system. While the sampling system performed to specifications, the electronics used to measure the above three parameters gave problems. Thus conductivity and temperature data are not given in this report and pH data are presented only in four broad classes. An overall sampling rate of 25 per hour was maintained at a sample density of one sample per 5 km^2. Although lake waters were the primary sampling medium, streams, bogs and small pot holes were sampled to fill in areas where large tracts did not contain any lakes.

Analytical:

Cu and Zn in the waters were determined by atomic absorption spectrometry after extraction of 50 mls of water chelated with APDC into MIBK. Uranium was determined fluorimetrically on 50 mls of water by the method of Smith and Lynch, 1969. Detection limits are 3 ppb for Zn and Cu and 0.01 ppb for U. This orientation study showed that a large proportion of the waters collected contained less than the detection limit for these three elements. This has caused the investigation of alternative techniques of analysis: fission track methods for uranium and graphite atomizer/atomic absorption method for Cu and Zn.

Copper Results

At the sample location adjacent to the uranium occurrence near Mountain Lake, the copper value obtained (14 ppb) is one of the highest in the survey area. This association with uranium, makes copper an important indicator in the search for uranium. Copper is not as mobile or as easily leached as uranium particularly in the carbonate-rich environments. Thus where uranium is anomalous and the copper value is low may be reflecting distance of the sample from source. The highest uranium site (5.5 ppb) shows only a slight elevation of the copper concentration, which perhaps indicates the source is more distant from the sample site than at Mountain Lake or that copper is absent in the source mineralization. Directly north of Mountain Lake, near the Dismal Lakes, the highest copper (15 ppb) was recorded, close by outcrop mapped as Upper Hornby sandstone unit but no uranium or zinc values of significance was indicated here or nearby. It is intriguing because of the proximity to a claim group where secondary uranium enrichment has been reported (DIAND, 1976).

Most of the stronger copper values coincide with areas underlain by Great Bear Batholith ignimbrites, i.e., south of Lac Rouviere, adjacent to the Teshierpi fault (11 ppb Cu).

About 4 miles southwest of Mountain Lake there is a copper occurrence in granite and also a showing on the south side of Teshierpi Mountain in a small plug of Coppermine basalt (Kindle, 1972). In both cases the copper content of the waters showed some slight increase from sites some distance from these showings.

The copper values from areas draining the Muskox Intrusion, particularly on the western edge, show an appreciable increase, south of All Night Lake and again just north of the Coppermine River.

Along the western margin of the Mouse River, halfway between Speers Lake and the Coppermine River, there are high copper contents in an area draining the lower Hornby sequence (unit 4) rocks. The source of these elevated copper values is not evident and warrant further investigation, particularly where these coincide with elevated uranium content.

References

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Cameron, E.M., Durham, C.C.

1975: Further studies of hydrogeochemistry applied to mineral exploration in the northern Canadian Shield. G.S.C. Paper 75-1C, p. 233-238.

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DISTRICT OF MACKENZIE, N.W.T.
1975