LEGEND

Note: This legend is common to National Geochemical Reconnaissance Map 14-1976, Open File 418; Map 15-1976, Open File 419 and Map 16-1976, Open File 420

CENOZOIC

QUATERNARY

- **23** Unconsolidated glacial and alluvial deposits

MESOZOIC

CRETACEOUS

- **22** Sandstone, shale and conglomerate; 22a, BONNET PLUME FORMATION: sandstone, shale and coal; 22b, BONNET PLUME FORMATION: conglomerate and sandstone; 22c, ARTIC RED FORMATION: shale and siltstone
- **21** Hornblende and hornblende/biotite syenite, commonly porphyritic and uneven textured; minor diorite
- **20** Diorite and gabbro
- **19** Mottled green and maroon shale and brown siltstone
- **18** KENO HILL QUARTZITE: massive quartzite; minor slate and phyllite

JURASSIC

- **17** LOWER SCHIST division: argillite, slate, phyllite and minor quartzite; 17a, sandstone and shale

TRIASSIC

- **16** SHUBLIK FORMATION: limestone and shale; unnamed clastics and carbonates

PALEOZOIC

PERMIAN

- **15** TAHKANDIT FORMATION: grey chert and limestone; 15a, JUNGLE CREEK FORMATION: sandstone, shale, carbonates and clastics; undivided formation

CARBONIFEROUS TO PERMIAN

- **14** ETTRAIN FORMATION: shale and limestone; HART RIVER FORMATION: shale, siltstone and limestone; Lisburne Group undivided; 14a, limestone, black shale, chert, chert-pebble conglomerate, argillaceous, limestone, sandstone and slate
- **13** CKY KAYAK FORMATION: shale; unnamed conglomerate

DEVONIAN

MIDDLE DEVONIAN TO CARBONIFEROUS

- **12** CANOL FORMATION: black shale; NATION RIVER FORMATION: chert-pebble conglomerate and chert-grain sandstone; shale, argillite, slate, limestone and minor chert-pebble conglomerate and' quartzite

LOWER TO MIDDLE DEVONIAN

- **11** OGILVIE FORMATION: limestone; CRANSWICK FORMATION: limestone; MICHELLE FORMATION: limestone and shale; unnamed limestone, dolomite and interbedded black chert

ORDOVICIAN AND SILURIAN

- **10** ROAD RIVER FORMATION: shale, limestone, black chert and argillite; minor quartzite and chert-pebble conglomerate
- **9** Dolomite and limestone; argillaceous limestone and dolomite; dark volcanic rocks

CAMBRIAN

- **8** Limestone and dolomite; minor red shale; unnamed clastics; 8a, massive sandstone, conglomerate, shale and local andesitic and basaltic flows and sills; 8b, JONES RIDGE limestone; unnamed dolomite and limestone

PRECAMBRIAN

PRECAMBRIAN AND/OR LATER

- **7** Dark green volcanic rocks, breccia, tuff, agglomerate, shale, chert, siltstone and limestone
- **6** Quartzite, sandstone, quartz-pebble conglomerate, maroon and green shales, chlorite schist, quartz-mica schist, phyllite, limestone and black chert

HADRYNIAN

- **5** Unnamed carbonates and clastics
- **4** RAPITAN GROUP: mudstone, limestone, iron formation and dolomite

HELIKIAN

- **3** KATHERINE FORMATION: sandstone and dolomite; TSEZOTENE FORMATION: sandstone and dolomite; unnamed carbonates, shale and gypsum
- **2** Orange dolomite, slate, phyllite, grey dolomite, grey and maroon shale, quartzite, conglomerate, limestone, black shale, argillite and siltstone

HELIKIAN AND (?) APHEBIAN

- **1** Argillite, slate, phyllite quartzite, dolomite, conglomerate and silicated limestone

Drift-covered areas..

Geological contact..

Fault..

Geology generalized for geochemical maps by W.D. Goodfellow from Larsen Creek (116A) and Dawson (116B&C) by L.H. Green (G.S.C. Mem. 364, 1972); and Hart River (116H) by D.K. Norris (G.S.C. Open File 279, 1975)

Geological cartography by the Geological Survey of Canada

Base-map assembled by the Geological Survey of Canada from maps published at the same scale by the Surveys and Mapping Branch in 1954, 1957, 1958

Mean magnetic declination 1977, 32°28.7' East, decreasing 1.6' annually. Readings vary from 32°50.4' in the SE corner to 32°03.6' in the NW corner of the map-area

Elevations in feet above mean sea-level

GEOCHEMICAL SYMBOLS AND DATA PRESENTATION

The absolute background and anomalous concentrations, and the contrast between them will vary regionally depending on factors such as the physiography, geology, the sample media and the chemistry of the elements determined.

Physiographical regions within the survey area include the Wernecke, Ogilvie and Richardson Mountains, and the Eagle Plains and Bonnet Plume basin. Most of the sediment in streams intersecting mountains terrain has been derived by the mechanical breakdown of the underlying rocks and has been transported as particulates during the heavy spring run-off. Stream sediments range in size from fine silt to boulders with only minor organic matter present. By contrast, streams intersecting the Eagle Plains and Bonnet Plume basin are commonly discontinuous, flow at low velocites, and deposit organic-rich sediment. Under these conditions, organic matter may be expected to play a significant role in the transport and deposition of certain elements (eg. U, Zn, Cu, Co, Ni, Mo, etc.) and may therefore produce spurious anomalies. It is suggested that field observations, such as sediment composition, present in the data listing be considered when examining the metal content of any specific site.

The geology of the survey area is represented by sedimentary, volcanic and intrusive rocks that range in age from lower(?) Proterozoic to Upper Cenozoic, with almost every period represented. To date, U has been reported to occur in breccias associated with the Proterozoic sedimentary and volcanic rocks of the Wernecke Mountains. Other geological environments that are considered to have a high U potential in the survey area include the following: the Mesozoic alkaline stocks and batholiths; the Paleozoic shales as a source of low grade and high tonnage U; the Mesozoic and Cenozoic sedimentary basins such as the Eagle Plains and Bonnet Plume basin; and structures such as faults and unconformities which may serve as favorable traps for deposition of U.

Because of the mechanical derivation of stream sediments from mountainous terrain, the geochemistry is strongly influenced by the chemistry of the underlying rocks. For example shales, or their metamorphic equivalents, which are common in Proterozoic, Paleozoic and Mesozoic rocks, have high background concentrations for U and most other elements determined which is reflected in the geochemistry of the stream sediments. Therefore, it is suggested that each stream system be evaluated in terms of the local factors affecting the geochemistry of the surficial environment.

The element associations expected for particular types of U and base metal mineralization should be considered when evaluating geochemically anomalous stream sediments. For example, Ba, Cu, Co and to a lesser extent, Mo, F, and W are associated with the Proterozoic U occurrences whereas Mo, F and to a lesser extent Pb, would be expected to be associated with primary U mineralization in alkaline plutons. Furthermore, element associations in stream sediments and waters will be useful in identifying regional geochemical trends that may be, at least in part, controlled lithologically. Anomalous geochemical trends within these regional patterns should then be evaluated for possible mineralization on the basis of not only the absolute concentrations but also element interrelations.

The reliability of hydrogeochemical maps has to be assessed using different criteria than for stream sediment maps. The data for the field duplicate pairs, presented in the data listings, give a measure of the combined field and analytical errors. The majority of the samples from an individual drainage system were collected over a short time period in order to minimize ephemeral climatic effects. Seasonal variations in the magnitude of anomalies have been detected. However, in terms of contrast, the anomalies are persistent because both background and anomalous values vary sympathetically over longer periods of time. Considering the above, cautions must be exercised when using the geochemistry of stream waters to delineate regional trends.

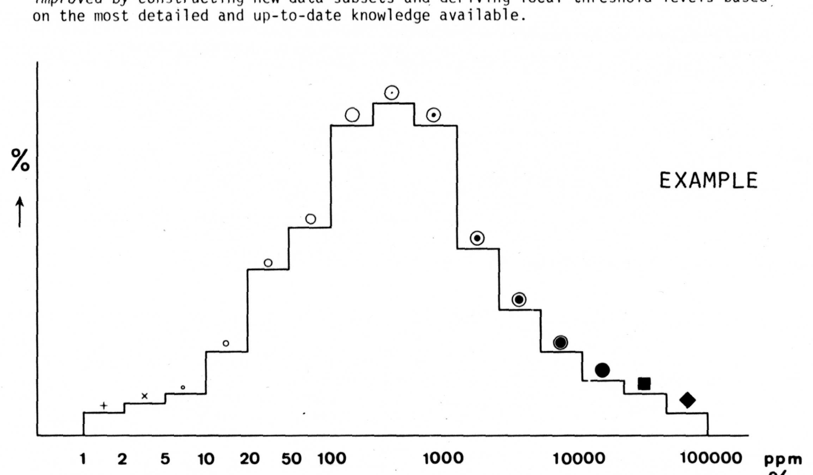
Samples displaying the highest U and F levels are not necessarily indicative of mineral occurrences. Differential leaching of bedrock and recyling of U and F in highly carbonated waters can lead to high U and F levels; the pH in these situations may be expected to give a qualitative indication of the alkalinity. The data should be interpreted in terms of the drainage basin geology, i.e. potential primary source and secondary host rocks; and the uranium and other elemental data in stream sediments collectively used to support a particular model of uranium provenance.

The concentration of an element at a sample site is graphically represented as one of 15 symbols; if a sample was collected but there is no data available a dot is plotted. The symbols are arranged so that they first increase in size to the eighth symbol and then increase in blackness to the fifteenth. The two small crosses at the low end of the scale are used to respectively denote concentrations below the analytical detection limit, or in the data group containing the detection limit. The data are grouped on a semi-logarithmic scale, i.e. 1,2,5,10,20,50,100 etc. Five decades can be spanned and this arbitrary division has been chosen for the continuing Canada wide series of maps constituting the National Geochemical Reconnaissance.

The choice of symbols and the data groups they represent for any specific element is based on the histogram and cumulative frequency plot for the total survey data from one, or more contiguous, open file sheets covered in one field season. The eighth symbol is used for the model group as defined by the histogram, this group usually includes the median of the data as defined by the 0.5 (50%) point on the cumulative frequency plot. Some, or all, of the remaining 14 symbols are chosen to achieve an appropriate graphical impact.

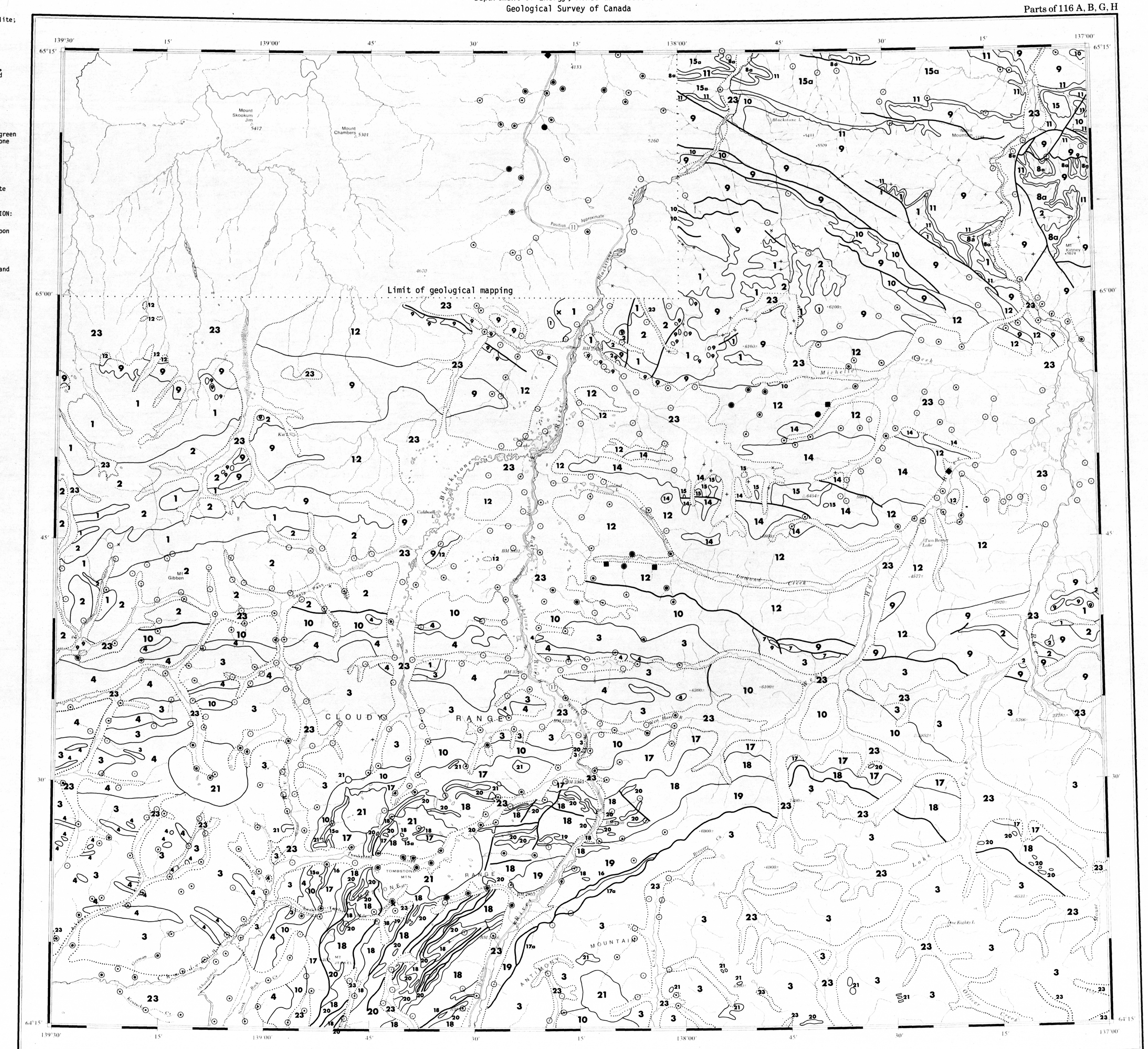
The raw data symbol maps are only intended to assist the rapid inspection of the data for gross regional features. To fulfil the need for a more specific and thorough interpretation, the field and analytical data provided in the data listings should be consulted. To assist in the appraisal of the data in terms of the symbol map bedrock geology, a table of summary statistics for the drainage samples dominantly derived from within each bedrock unit, or broad lithologic unit, is presented below the histogram. In many instances, the table will also illustrate, more clearly than the maps, the dependence of mean geochemical levels on bedrock type. It may also be observed that whilst the total data appears to approximate a log-normal distribution the data for individual map or lithologic units appears to approximate a normal distribution except where the concentration of an element at or below the detection limit for a large number of samples (e.g. U and F in water; Ag, Mo and W in sediment). In these situations, the frequency distribution will be positively skewed and the mean will not represent the total population. Therefore, caution must be exercised when using the table of summary statistics to establish background and anomalous concentration ranges for a given element.

To comprehensively study an area, all available geological, environmental and recorded data should be utilized. The data separation by bedrock type can often be improved by constructing new data subsets and deriving local threshold levels based on the most detailed and up-to-date knowledge available.



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

Parts of 116 A, B, G, H



NATIONAL GEOCHEMICAL RECONNAISSANCE MAP 14-1976

FLUORINE IN STREAM WATERS

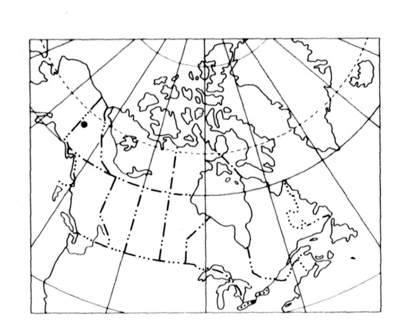
URANIUM RECONNAISSANCE PROGRAM

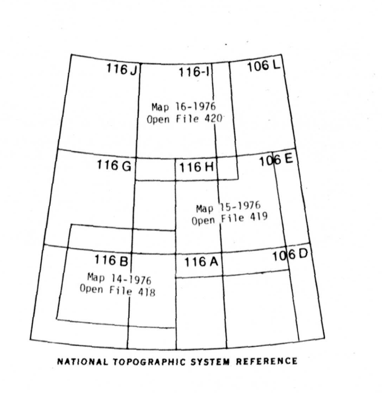
Scale 1:250,000

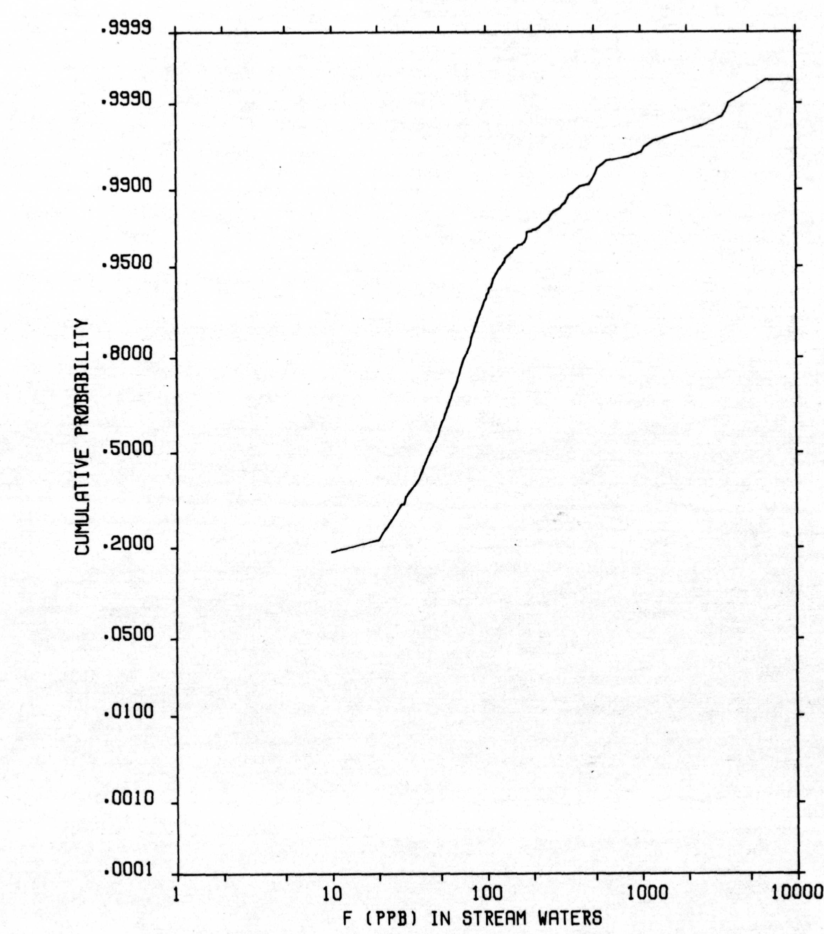
Kilometres 6 0 6 12 18 Kilometres

Miles 4 0 4 8 Miles

Universal Transverse Mercator Projection







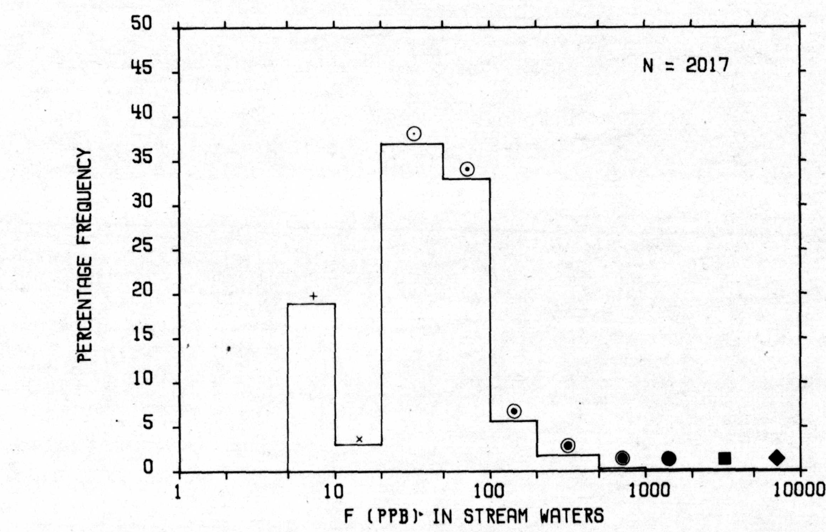


Table of Summary Statistics for Sample
Media Underlain by the Different Lithologies

Lithology	No. of Samples	Geometric Mean	Arithmetic Mean	Arithmetic S.D.	C.V.%
Dolomite	47	24	29	19	65
Limestone	317	19	24	20	82
Argillite	180	21	69	336	490
Shale	440	58	85	191	226
Mudstone	6	28	28	8	28
Siltstone	38	57	64	33	52
Sandstone	729	45	67	245	367
Quartzite	120	52	60	42	70
Conglomerate	66	33	38	22	58
Syenite	8	113	139	89	64
Basalt	18	58	63	27	42
Diorite	6	46	50	27	53
Undivided Sedimentary Rock	42	95	375	1471	392

Data units are in ppb

NATIONAL GEOCHEMICAL RECONNAISSANCE MAP 14-1976
OPEN FILE 418

Resource Geophysics and Geochemistry Division

Geological Survey of Canada, Ottawa

Planning and coordination by staff of the Geochemistry Section, Resource Geophysics and Geochemistry Division, and of the Cordilleran Subdivision, Regional and Economic Geology Division.
Field operations supervised by N.G. Lund and W.D. Goodfellow
Analytical contract supervision by J.J. Lynch
Data monitoring and compilation by R.G. Garrett, N.G. Lund and D.J. Ellwood.

Contractor

Chemical analysis by Barringer Research Ltd.

This map forms one of a series of 45 sheets released under Geological Survey of Canada, Open Files 418, 419, 420. The Open Files consists of data for 12 elements each for stream sediments, percent loss on ignition, 2 elements for stream waters and sample site location

The data are also available in digital form. For further information please contact:

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NATIONAL GEOCHEMICAL RECONNAISSANCE MAP 14-1976
OPEN FILE 418
NORTHERN YUKON TERRITORY, 1976
FLUORINE IN STREAM WATERS