

GEOLOGICAL SURVEY OF CANADA



COMMISSION GÉOLOGIQUE DU CANADA

DEPARTMENT OF ENERGY, MINES AND RESOURCES  
MINISTÈRE DE L'ÉNERGIE, DES MINES ET DES RESSOURCES

**AIRBORNE GEOPHYSICAL SURVEY  
1986**

**LACORNE BATHOLITH AREA  
QUEBEC  
(Barraute 32C/5)**

**GAMMA RAY SPECTROMETER COLOUR MAPS  
with accompanying  
Geology, Magnetic and VLF Profile Maps,  
and Stacked Profile Booklet**

**Geological Survey of Canada Open File 1596**

**OPEN FILE  
DOSSIER PUBLIC**

**1596**

**GEOLOGICAL SURVEY OF CANADA  
COMMISSION GÉOLOGIQUE DU CANADA  
OTTAWA  
1987**



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**Canada**

# **AIRBORNE GAMMA RAY SPECTROMETER SURVEY LACORNE BATHOLITH AREA - QUEBEC**

In the September 1986 a multi-parameter geophysical survey was flown in the Val D'Or region of Quebec. The survey location is shown on the index map. The main purpose of the survey was to collect quantitative gamma ray spectrometer data as a mapping technique to identify bedrock units in the area displaying variations in the radioelement distribution. VLF electromagnetic data and total field magnetic data were also recorded and compiled as additional geophysical parameters.

The gamma ray spectrometer data are presented as a set of eight radioelement colour maps, the total count, potassium, equivalent uranium and equivalent thorium concentrations, the eU/eTh, eU/K and eTh/K ratios, and the ternary radioelement map. Accompanying the colour maps are VLF and magnetic profile maps, a flight line map with a superimposed topographic base and a geology map. The map scale is 1:100,000. Stacked profiles at a scale of 1:150,000 are also included under separate cover.

The airborne VLF measurements were obtained using a Herz Totem 1A airborne VLF system. The primary electromagnetic field is generated by VLF station NAA at Cutler, Maine, which transmits at 24.0 kHz. The secondary field is generated by eddy currents flowing in near-surface conductors. The profiles presented are the total field value (vector sum of the horizontal and vertical components) and the quadrature (out-of-phase) component of the vertical field. The total field is expressed in percent of the local primary field and the quadrature in percent of the along-track component. The mean values of the total field and quadrature component were removed along each flight line. The quadrature which depends on the flight line directions, was inverted for lines flown from east to west. A 5 point filter was applied to both total field and quadrature data for final presentation. Anomalies over conductors produce positive peaks on the total field trace and are of the cross-over type (negative to positive) on the quadrature trace. All VLF profiles are plotted on a zero line which represents the true flight path as monitored in-flight on a video screen.

All data were sampled at 1 second intervals. The airborne radiometric measurements were made using a 256 channel spectrometer, with twelve 102x102x406 mm NaI (Tl) detectors, flown at a mean terrain clearance of 125 m at 190 km/h. East-west flight lines were at 500 metre line spacing.

Potassium is measured directly from the 1.46 MeV gamma ray photons emitted by <sup>40</sup>K, whereas uranium and thorium are measured indirectly from gamma ray photons emitted by daughter products in their decay chains. Uranium is monitored by means of gamma ray photons at approximately 1.76 MeV from <sup>214</sup>Bi, and thorium, from 2.62 MeV photons emitted by <sup>208</sup>Tl. The energy windows used are as follows:

Total Count		0.41-2.81 MeV
Potassium	<sup>40</sup> K	1.36-1.56 MeV
Uranium	<sup>214</sup> Bi	1.66-1.86 MeV
Thorium	<sup>208</sup> Tl	2.41-2.81 MeV

Total count, uranium, thorium and potassium counts have been corrected for dead time, ambient temperature changes, background radiation, spectral scattering and deviations of terrain clearance from the planned survey altitude. In areas of extreme topographic variations accurate terrain corrections are difficult. Thus, estimates of radioelement concentrations may be inaccurate in these areas. The computer programs used to produce the contour maps and profiles are modified from Geological Survey of Canada Open File 109 "Airborne Gamma Spectrometry Data Processing Manual".

The values for the radioelement concentrations shown on the contour maps are "average surface concentrations", that is, an average for the area on the ground viewed by the spectrometer, an area which may contain varying amounts of outcrop, overburden and surface waters. As a result the concentrations as shown on the contoured maps are usually considerably lower than the concentrations in the bedrock. However, the radioelement distribution shown by the contour maps reflects the relative distribution of the elements in the bedrock.

Factors for converting airborne measurements to element concentration were determined by relating the corrected airborne count rates over a test strip in the Ottawa area to the known ground radioelement concentrations (R.L. Grasty and B.W. Charbonneau, 1974, Gamma-Ray Spectrometry Calibration Facilities, G.S.C. Paper 74-1B, pp. 69-71).

The conversion factors used are those listed below:

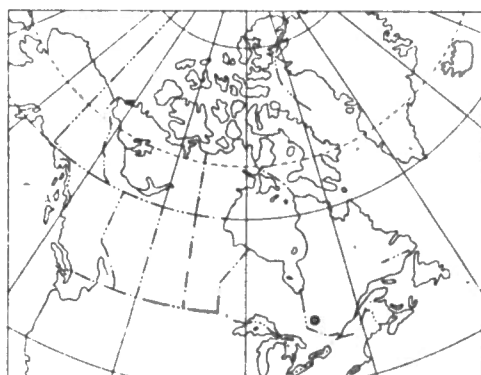
1 Ur Total Count	161	cps
1% K	91.0	cps
1 ppm eU	9.1	cps
1 ppm eTh	7.0	cps

Total count measurements are presented as units of radioelement concentration (Ur), as defined in International Atomic Energy Agency Technical Report Series No. 174, 1976.

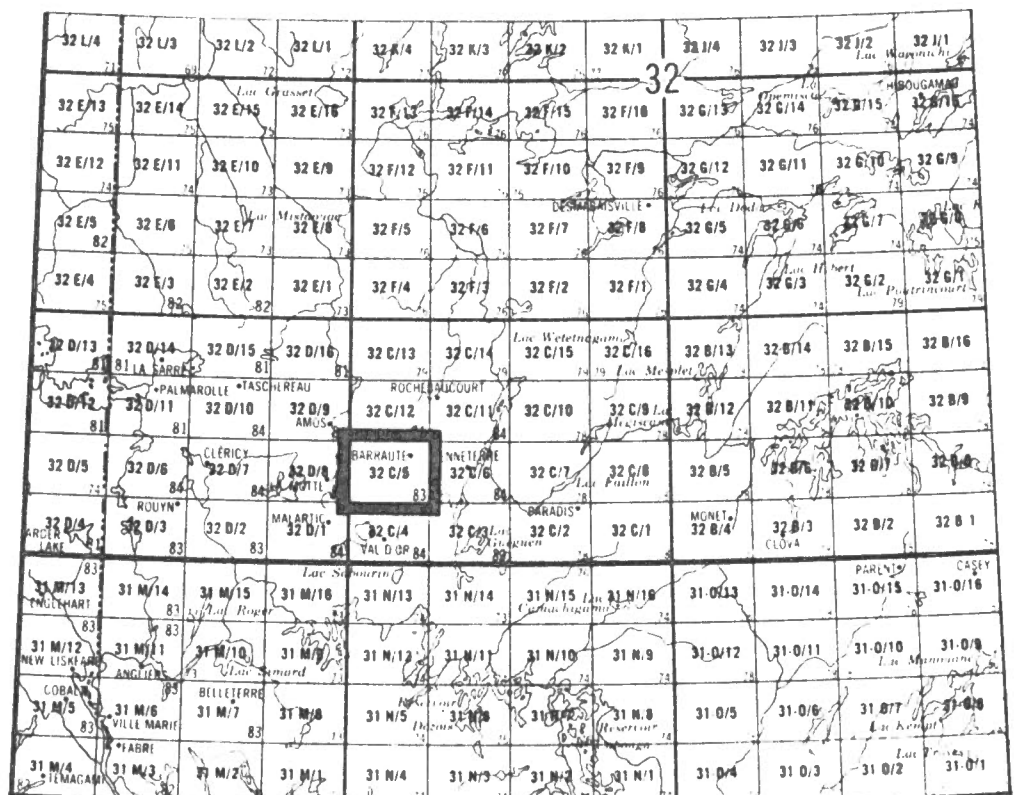
Information regarding the availability of this Open File release may be obtained from: Geological Survey of Canada, 601 Booth St., Ottawa, Ontario, K1A 0E8. Telephone (613) 995-4342.

Base map material supplied by Surveys and Mapping Branch

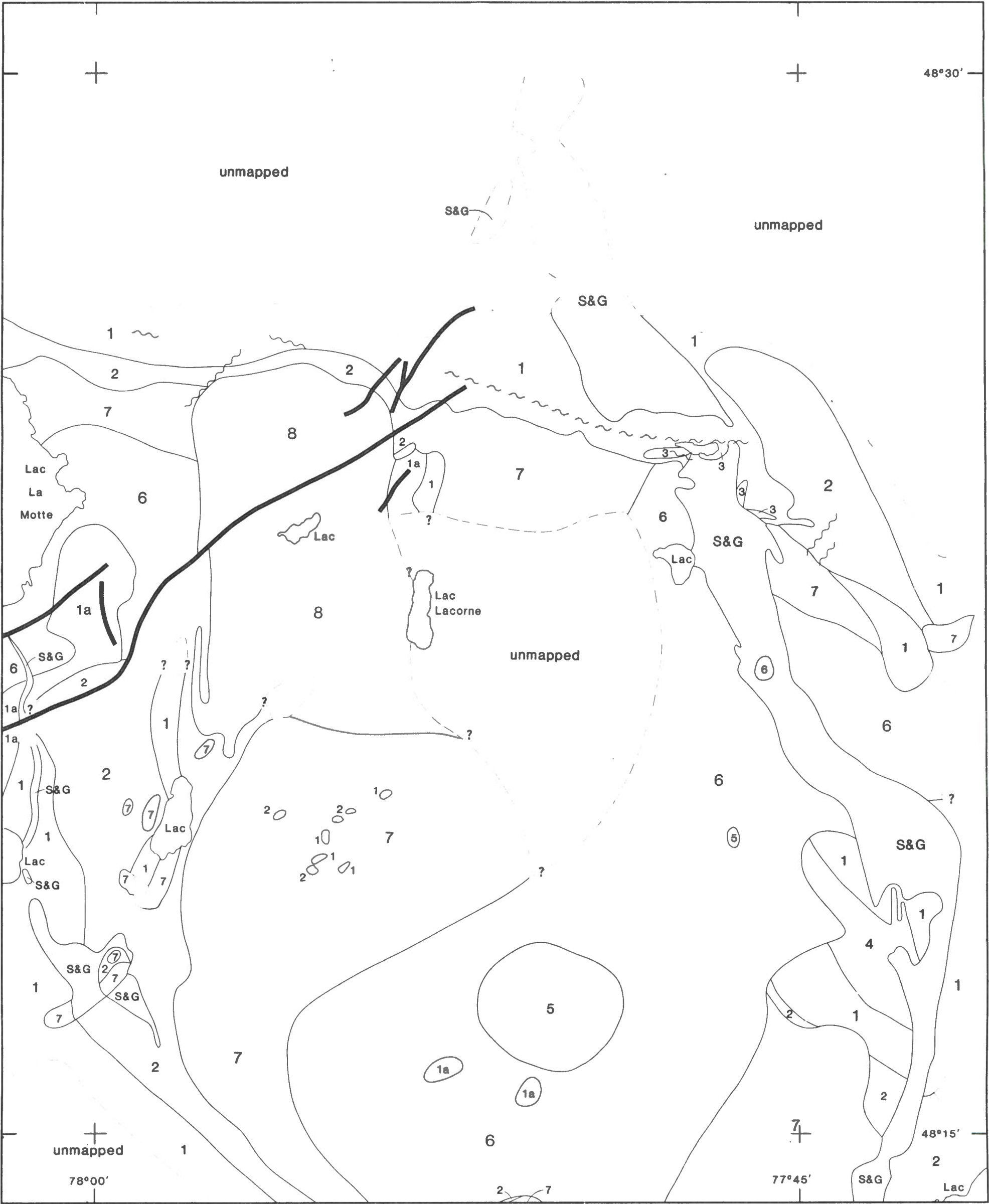
Airborne gamma ray spectrometer, VLF and magnetic survey flown, compiled and funded by Geological Survey of Canada



INDEX MAP



Location map



LACORNE BATHOLITH SURVEY  
VAL-D'OR AREA, QUÉBEC  
BARRAUTE  
32 C/5

0 km 2  
scale 1:100 000



LEGEND

PROTEROZOIC

Gabbro

ARCHEAN

8 Leucoadamellite

7 Biotite and/or  
hornblende granodiorite

6 Hornblende monzonite

5 Syenodiorite

4 Gabbro

3 Meta-peridotite, actinolite-  
chlorite rock, serpentinite

2 Biotite schist, derived from  
greywacke and conglomerate

1 Volcanic rocks, basaltic lavas  
and pyroclastic rocks

1a Coarse-grained hornblendite

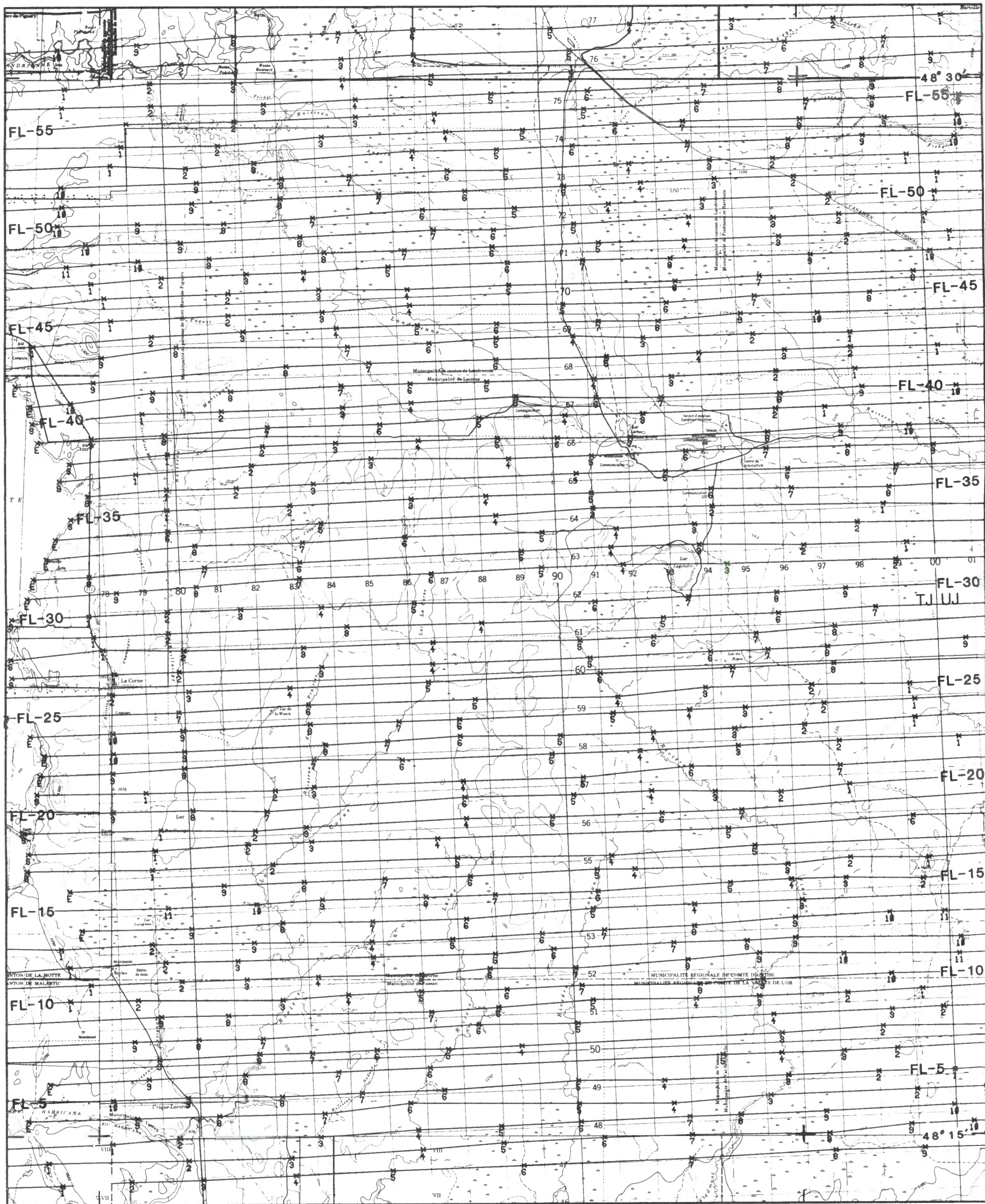
S&G Sand and gravel

Geological contact (approximate) . . . . .

Limit of geological mapping . . . . .

Fault (defined, approximate) . . . . .





LACORNE BATHOLITH SURVEY  
VAL-D'OR AREA, QUÉBEC  
BARRAUTE  
32 C/5

0 km 2

Base map scale 1:100 000

FLIGHT LINE MAP AND TOPOGRAPHIC BASE

Flight line and fiducial . . . FL-15 — x —





TERNARY RADIO-ELEMENT MAP  
LACORNE BATHOLITH SURVEY  
VAL-D'OR AREA, QUÉBEC  
BARRAUTE  
32 C/5

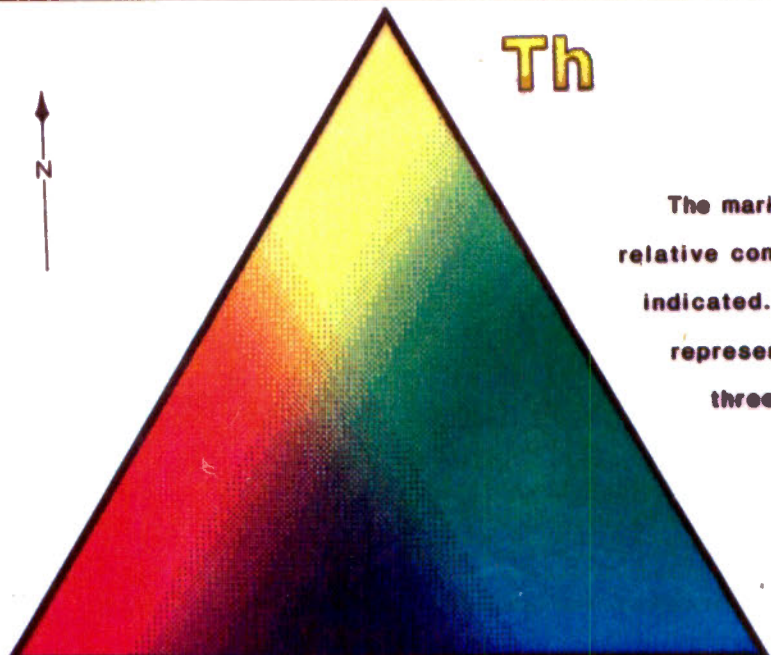
0 km 2  
scale 1:100 000

GEOLOGICAL SURVEY OF CANADA SECTOR  
Software Developed by: J. Broome  
Lithosphere and Canadian Shield Div.  
Data Compiled by: R. Hetu  
Mineral Resources Div.

Flown: July, 1986  
Flight Line Spacing: 500 meters



**K**

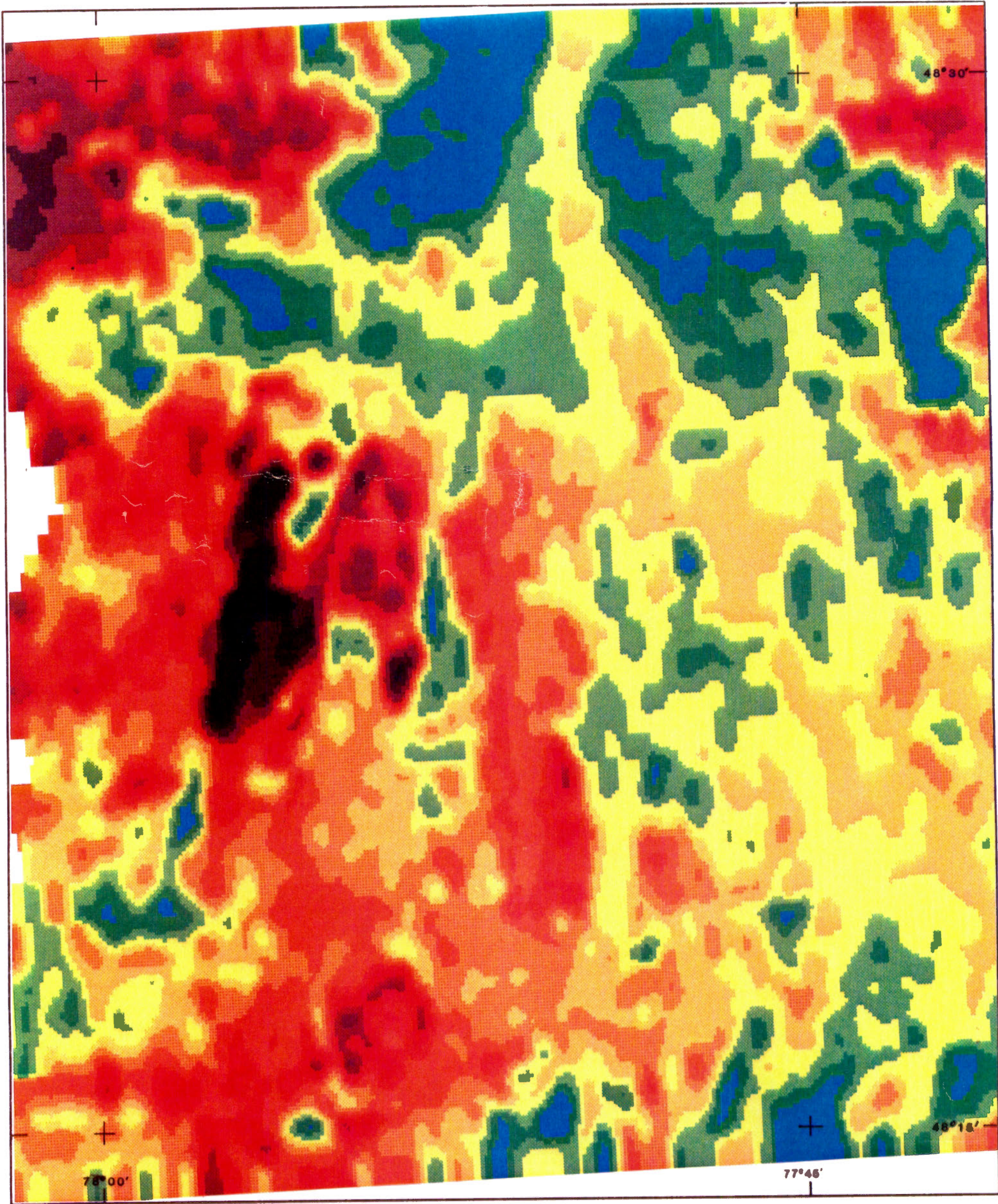


TERNARY LEGEND FOR  
THREE-COMPONENT  
RADIOMETRIC MAPS

The marked vertices represent 100% relative concentrations of the elements indicated. Intermediate locations represent different ratios of the three elements.

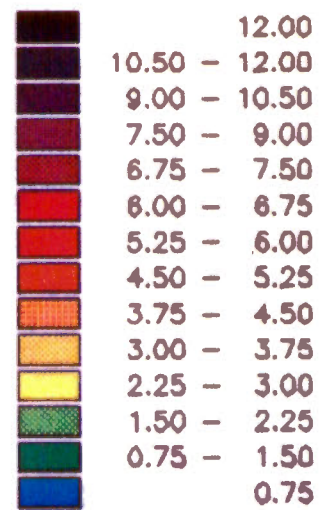
**U**





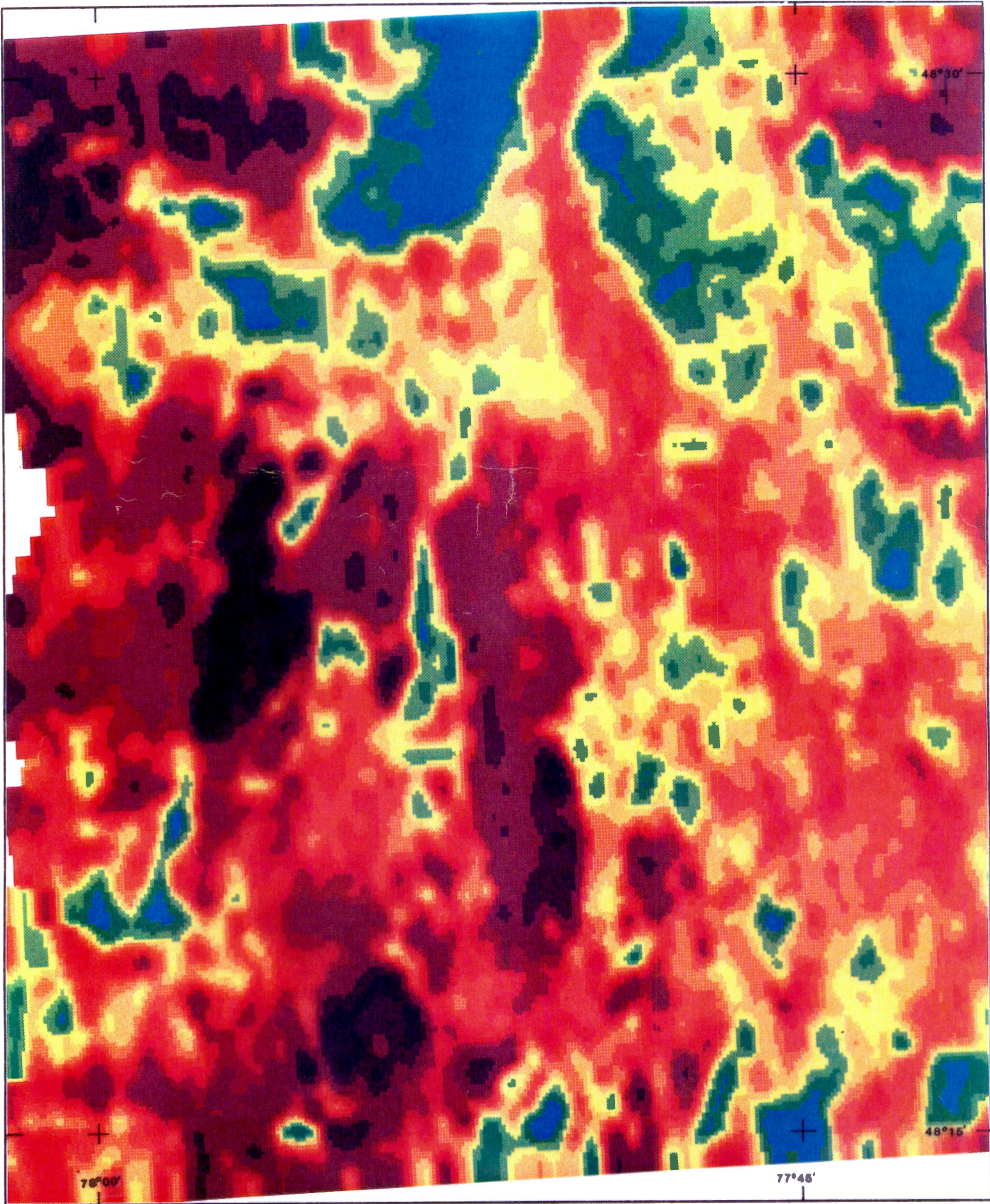
LACORNE BATHOLITH SURVEY  
VAL-D'OR AREA, QUÉBEC  
BARRAUTE  
32 C/5

0 km 2  
scale 1:100 000

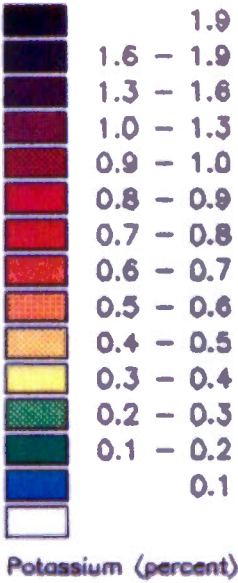


Total Count (Ur)

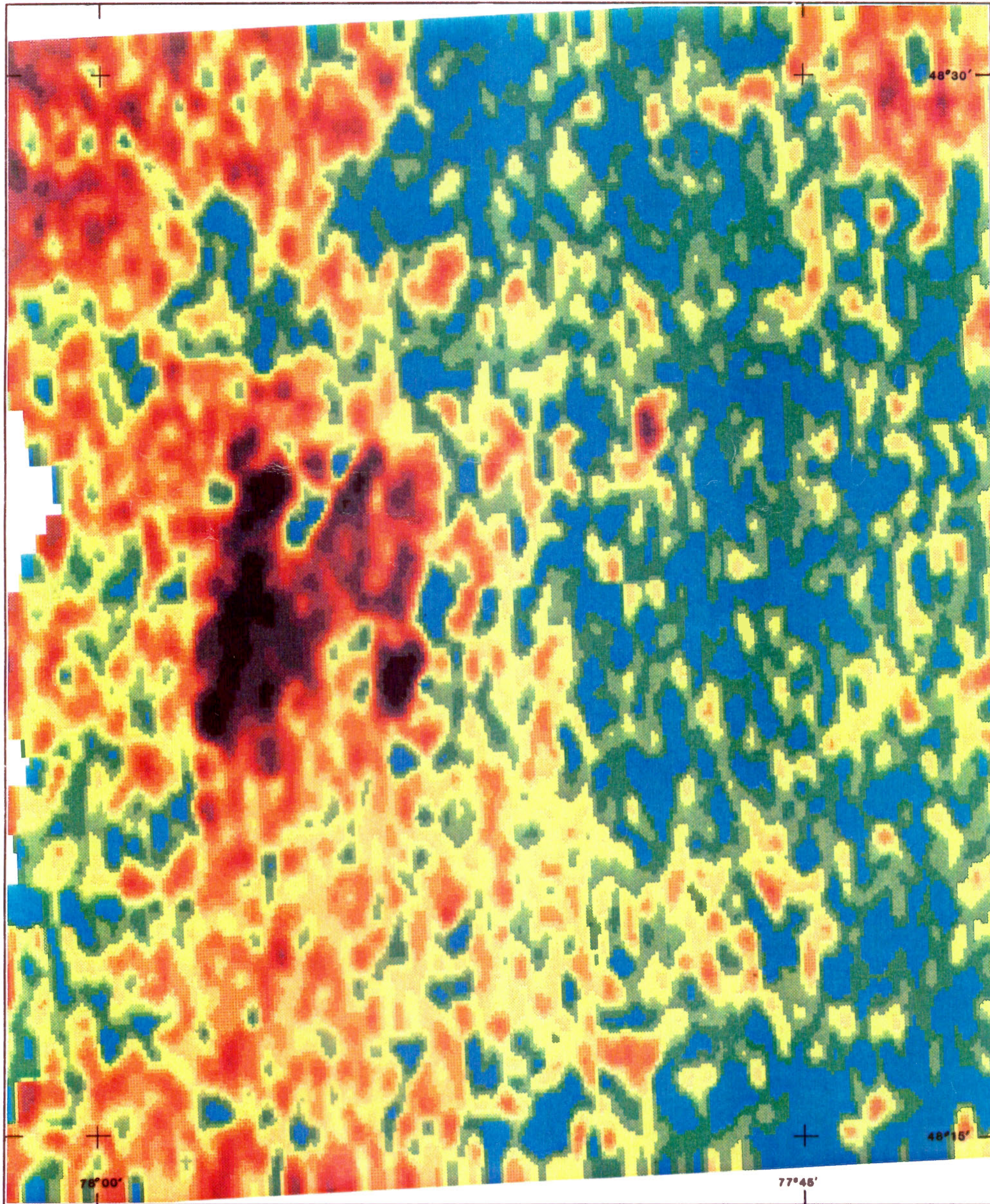




LACORNE BATHOLITH SURVEY  
VAL-D'OR AREA, QUÉBEC  
BARRAUTE  
32 C/5  
0 km 2  
scale 1:100 000

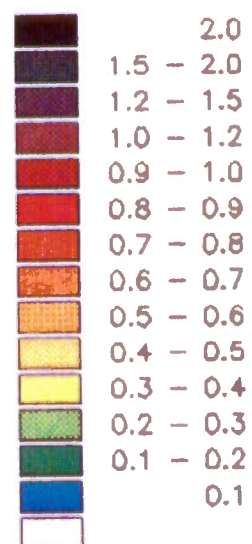






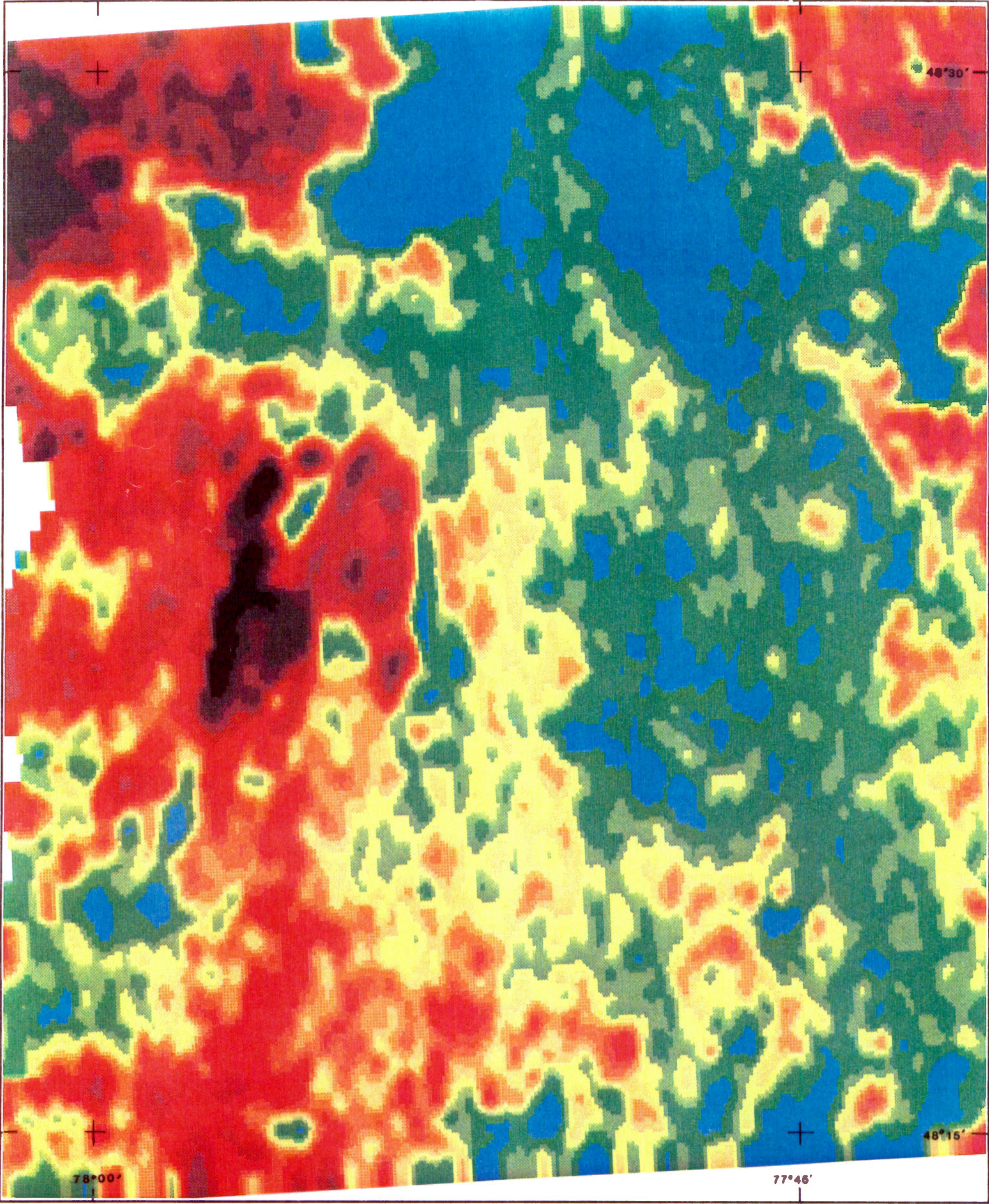
LACORNE BATHOLITH SURVEY  
VAL-D'OR AREA, QUÉBEC  
BARRAUTE  
32 C/5

0 km 2  
scale 1:100 000



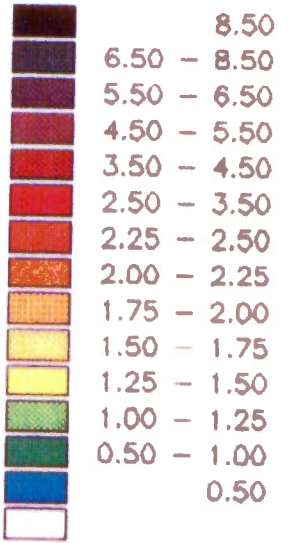
equivalent Uranium (ppm)





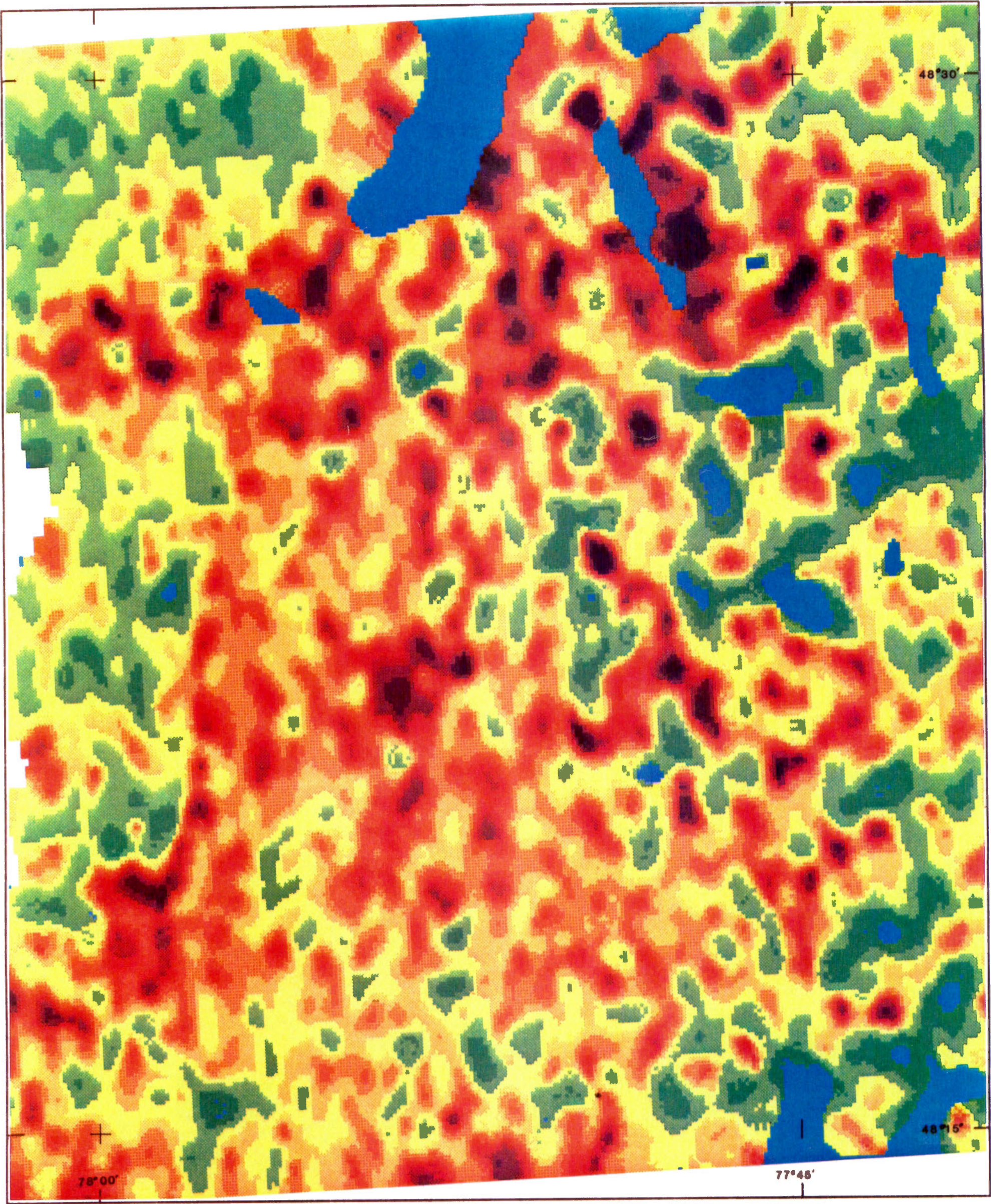
LACORNE BATHOLITH SURVEY  
VAL-D'OR AREA, QUÉBEC  
BARRAUTE  
32 C/5

0 km 2  
scale 1:100 000



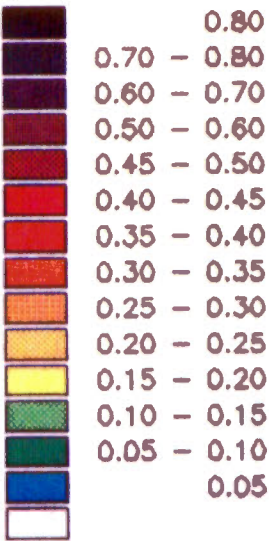
equivalent Thorium (ppm)





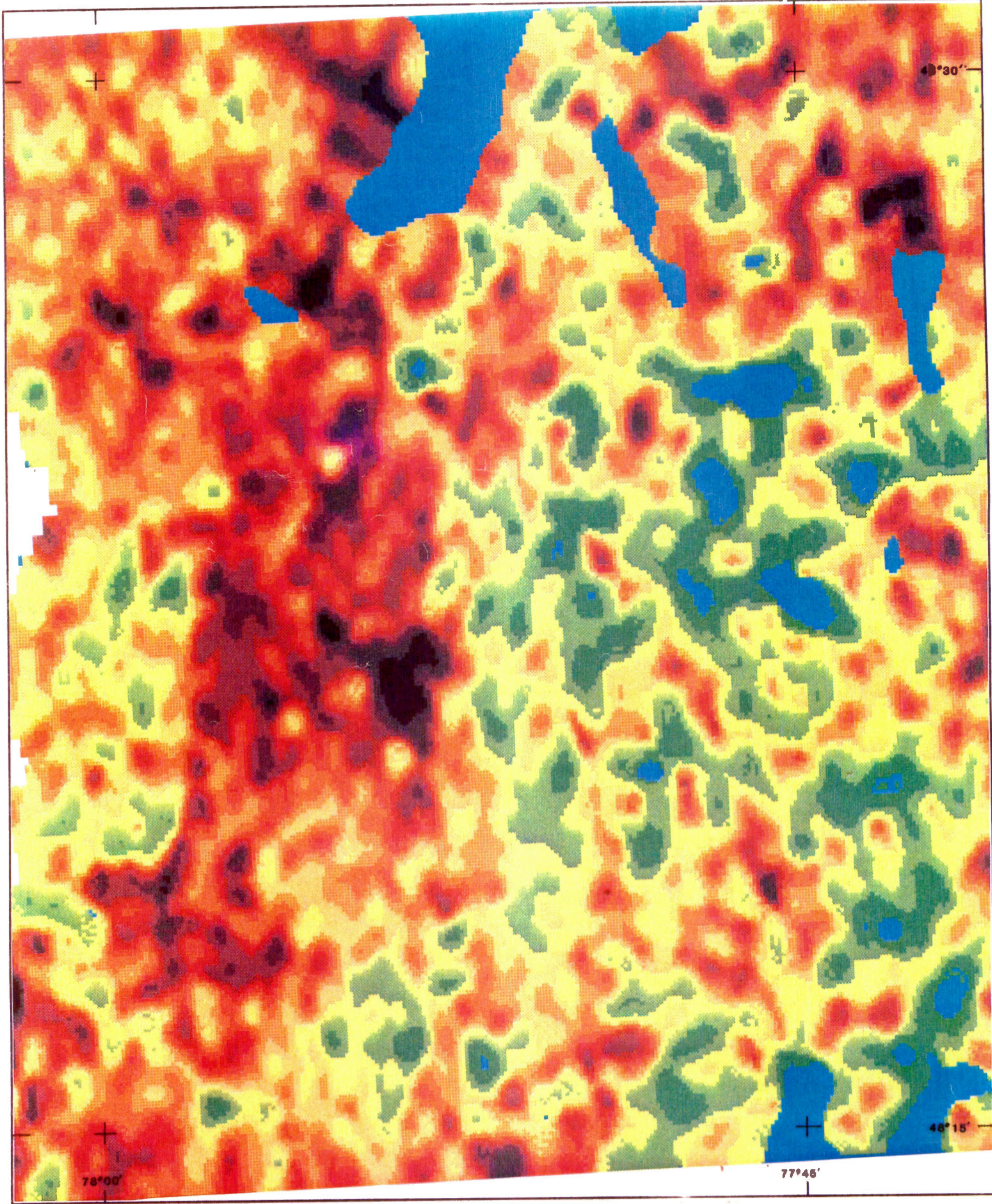
LACORNE BATHOLITH SURVEY  
VAL-D'OR AREA, QUÉBEC  
BARRAUTE  
32 C/5

0 km 2  
scale 1:100 000



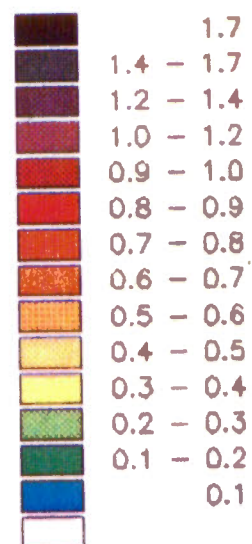
Uranium/Thorium (ratio)





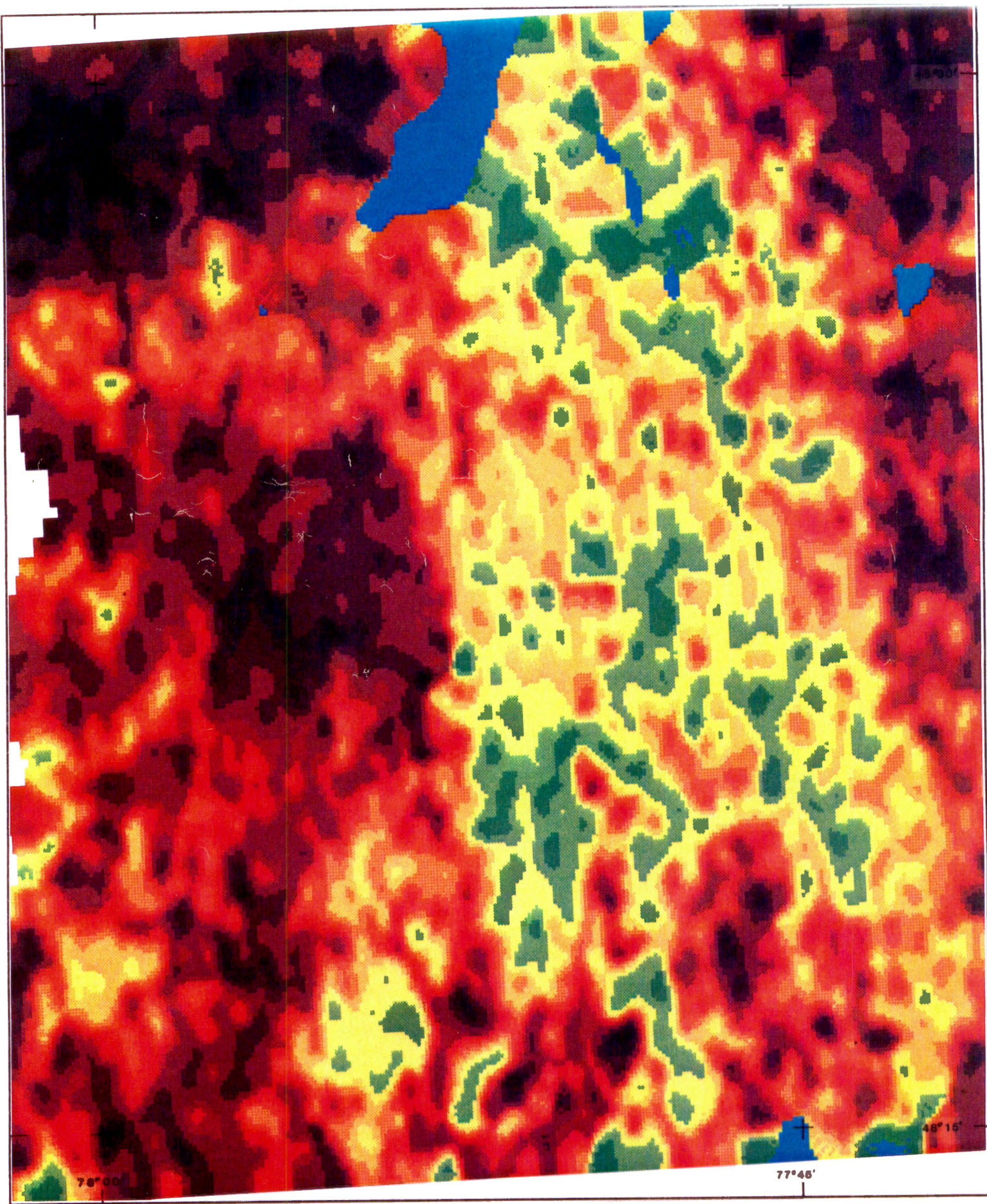
LACORNE BATHOLITH SURVEY  
VAL-D'OR AREA, QUÉBEC  
BARRAUTE  
32 C/5

0 km 2  
scale 1:100 000



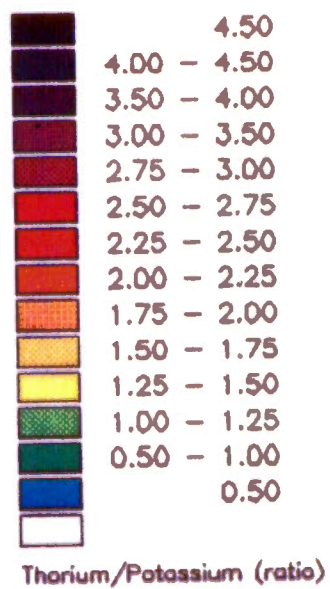
Uranium/Potassium (ratio)



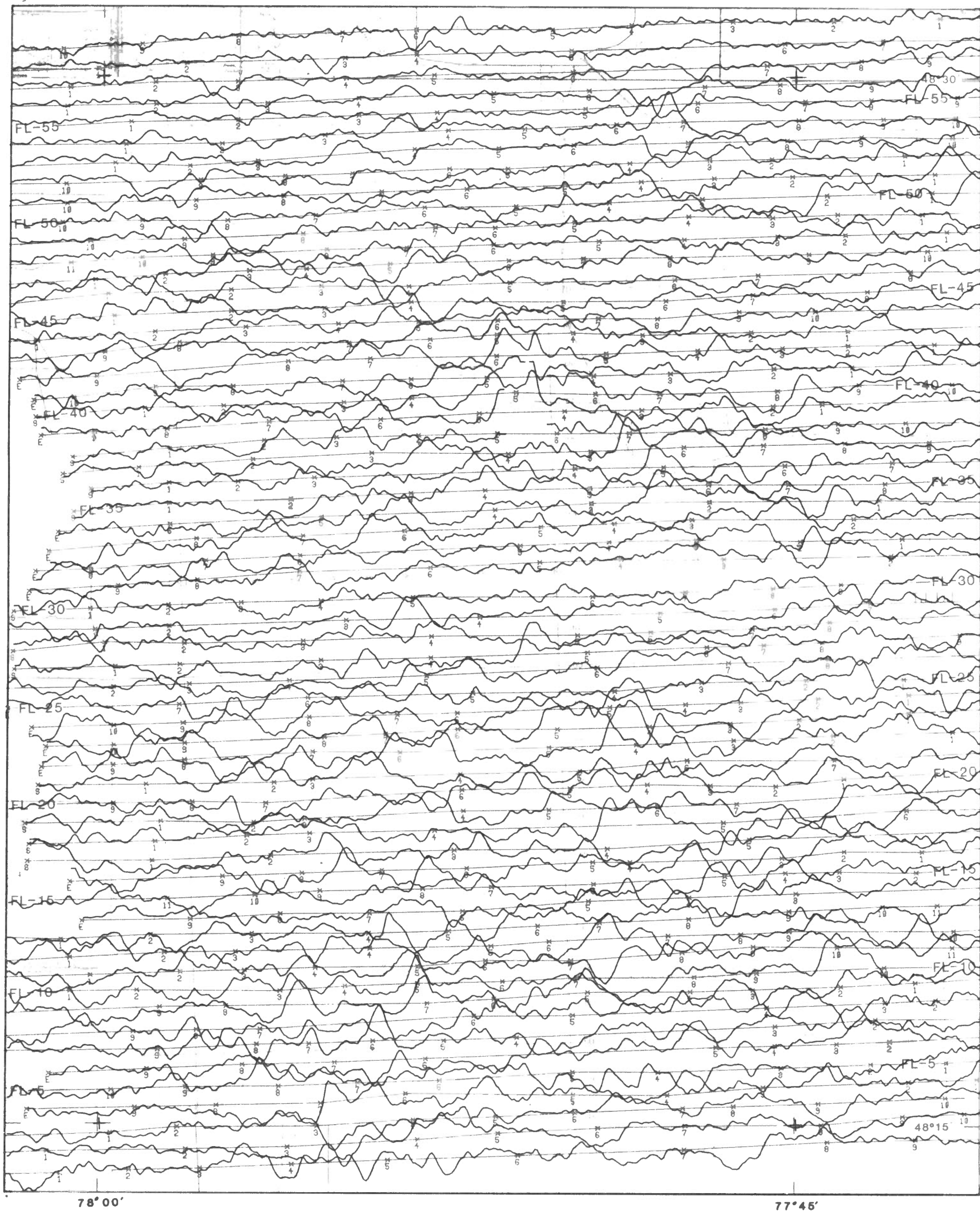


LACORNE BATHOLITH SURVEY  
VAL-D'OR AREA, QUÉBEC  
BARRAUTE  
32 C/5

0 km 2  
scale 1:100 000







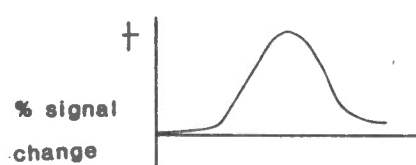
LACORNE BATHOLITH SURVEY  
VAL-D'OR AREA, QUÉBEC  
BARRAUTE  
32 C/5

0 km 2  
scale 1:100 000

Flight line and fiducial . . . FL-15

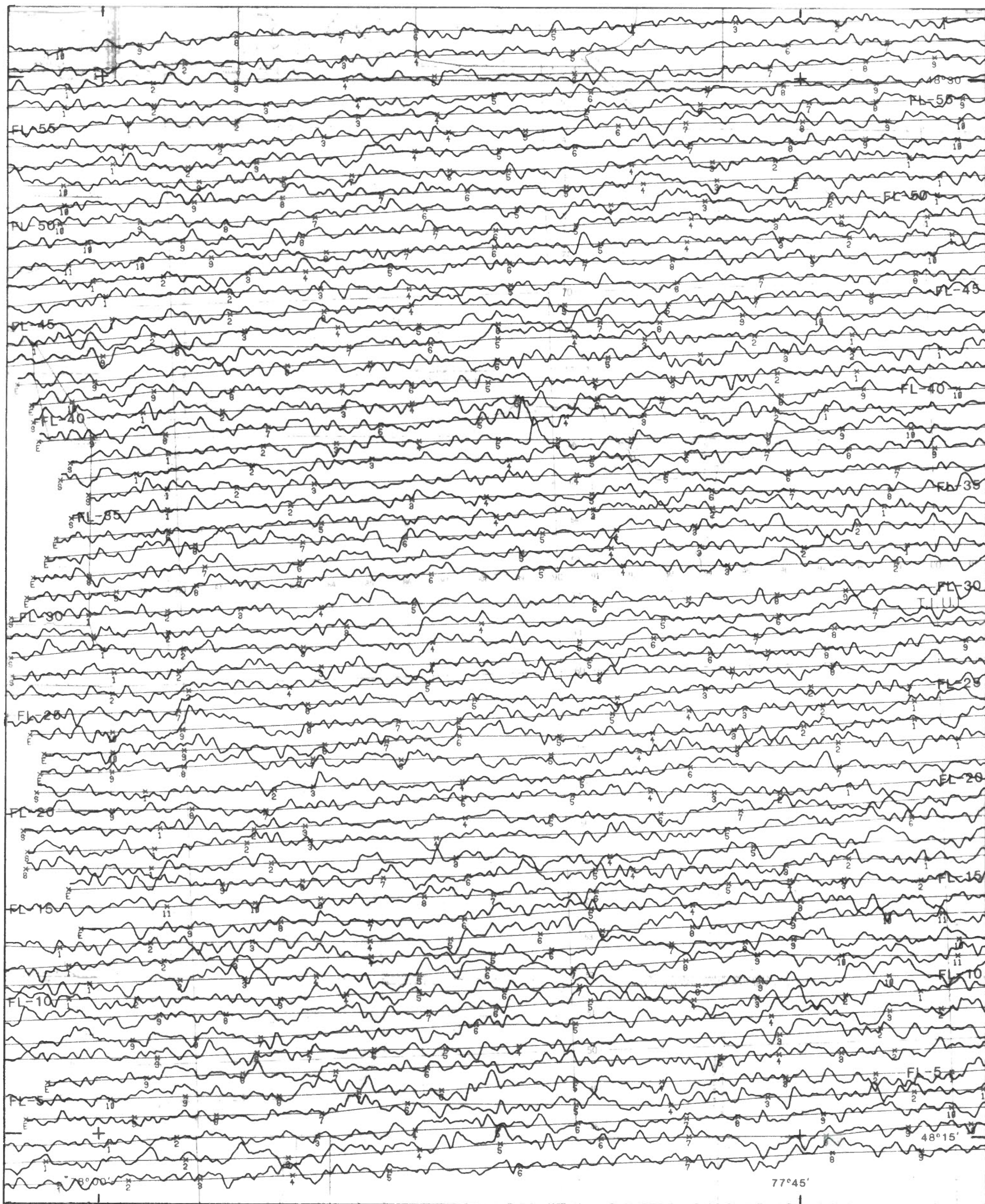
VLF TOTAL FIELD PROFILE MAP

Response to a conductor



Vertical Scale 20%/cm





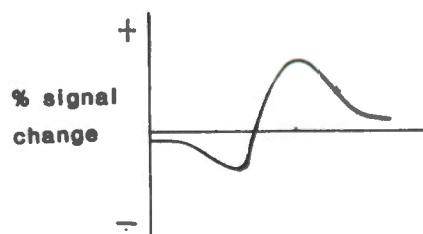
LACORNE BATHOLITH SURVEY  
VAL-D'OR AREA, QUÉBEC  
BARRAUTE  
32 C/5

0 km 2  
scale 1:100 000

Flight line and fiducial . . . FL-15

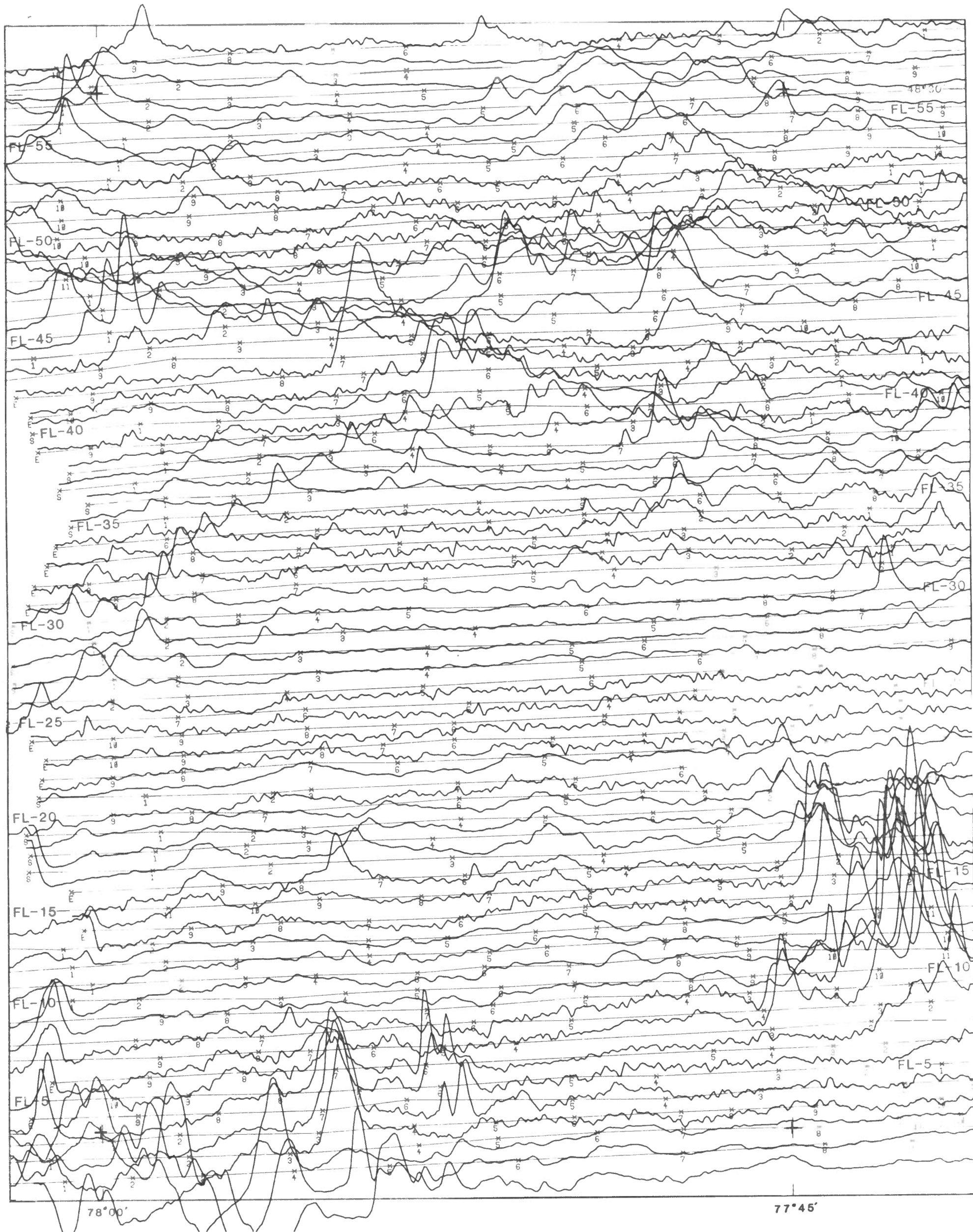
VLF QUADRATURE PROFILE MAP

Response to a conductor



Vertical Scale 10%/cm



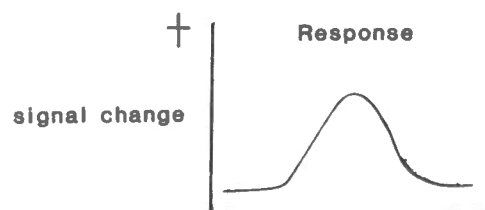


LACORNE BATHOLITH SURVEY  
VAL-D'OR AREA, QUÉBEC  
BARRAUTE  
32 C/5

0 km 2  
scale 1:100 000



MAGNETOMETER PROFILE MAP



Vertical Scale 250 gammas/cm

Flight line and fiducial . . . FL-15 — x — 4