GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF ENERGY, MINES AND RESOURCES

AIRBORNE GAMMA-RAY SPECTROMETRIC MAP

Airborne gamma-ray spectrometry data collected in Ontario during the fall of 1976, are presented:

(1) as contour maps of the total count, the potassium, equivalent uranium and equivalent thorium concentrations, and the eU/eTh, eU/K and eTh/K ratios; and

(2) as stacked profiles of the seven radiometric parameters plotted for each of the 32 flight lines.

The airborne measurements were made using a four window spectrometer, with twelve 22.86 cm x 10.16 cm NaI(Tl) detectors flown at a mean terrain clearance of 400 feet and 190 km/hr. North-south flight lines were at 5 km line spacing, and the numbered flight lines are plotted on each of the contour maps.

Potassium is measured directly from the 1.46 MeV gamma-ray photons emitted by potassium-40, 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 bismuth-214, and thorium, from 2.62 MeV photons emitted by thallium-208. The energy windows used are as follows:

Total Count		0.41-2.81 MeV
Potassium	K-40	1.37-1.57 MeV
Uranium	Bi-214	1.66-1.86 MeV
Thorium	Tl-208	2.41-2.81 MeV

Uranium, thorium and potassium counts were measured over 2.5-second intervals, total counts over 0.5-second intervals. The data have been corrected for dead time, ambient temperature changes, background radiation, spectral scattering and deviations of terrain clearance from the planned survey altitude. The computer programs used to produce the contour maps and profiles are described by R.L. Grasty, 1972 "Airborne Gamma Spectrometry Data Processing Manual", G.S.C. Open File No. 109.

The values for the radioelement concentrations shown on the contour maps are "average surface concentrations", that is, an average of 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 pattern shown by the contour maps reflects the 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 test strips in the Ottawa area to the known ground radioelement concentrations (R.L. Grasty, and B.W. Charbonneau, 1974, Gamma-Ray Spectrometer Calibration Facilities, G.S.C. Paper 74-1B, pp. 69-71).

The conversion factors used are approximately those listed below.

Total Count	1 ur	≈ 166 c.p.s.
	1%K	≈ 80 c.p.s.
	1 ppm eU	≈ 10 c.p.s.
	1 ppm eTh	≈ 7 c.p.s.

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

In order to produce the contour maps, data along the flight lines were averaged over seventeen 2.5-second counting intervals (approximately 2.2 km) and the effect of background count rates over the lakes was removed. This degree of averaging or smoothing is selected in order to:

(i) keep the smoothing to a minimum, i.e. have the smoothed values as close as possible to the original unsmoothed data, yet

(ii) use sufficient smoothing to utilize all data along flight lines between grid points while making the contouring grid dimension along the flight lines as close as possible to the spacing between flight lines.

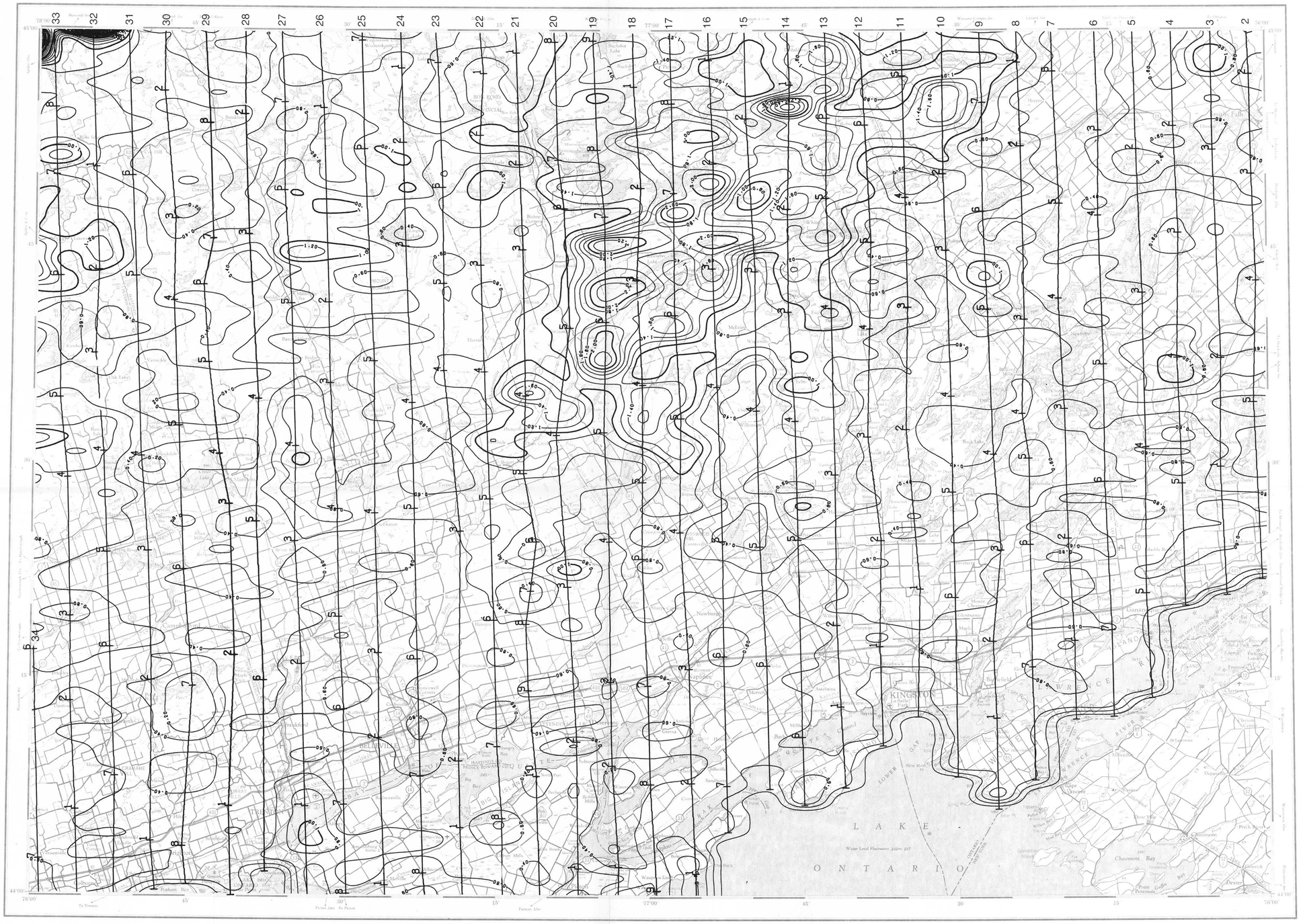
Compromise between (i) and (ii) results in a rectangular grid (approximately 5 km E-W and 2 km N-S) of data used for contouring. As a result of these compilation procedures, contours in some cases may be distorted in the direction perpendicular to the flight lines. This sort of imperfection is difficult to avoid in contouring data on widely spaced flight lines. It does not detract from the value of the map as the product of a reconnaissance survey, indicating the regional radioelement distribution pattern, but one should not attempt to use these contour maps for the precise location of exploration targets. More accurate locations of anomalies can be made using the data on the profiles.

This project was carried out according to the standard specifications of the Federal-Provincial Uranium Reconnaissance Program.

Airborne Gamma-Ray Spectrometry Survey 1976
by
Resource Geophysics & Geochemistry Division
Geological Survey of Canada

Base map material supplied by Surveys and Mapping Branch.

Cartography by Geological Survey of Canada.



(EQUIVALENT URANIUM / POTASSIUM) 10^4

KINGSTON

ONTARIO

31 C

Scale 1:250,000

Kilometres 6 0 6 12 18 Kilometres

Miles 4 0 4 8 Miles