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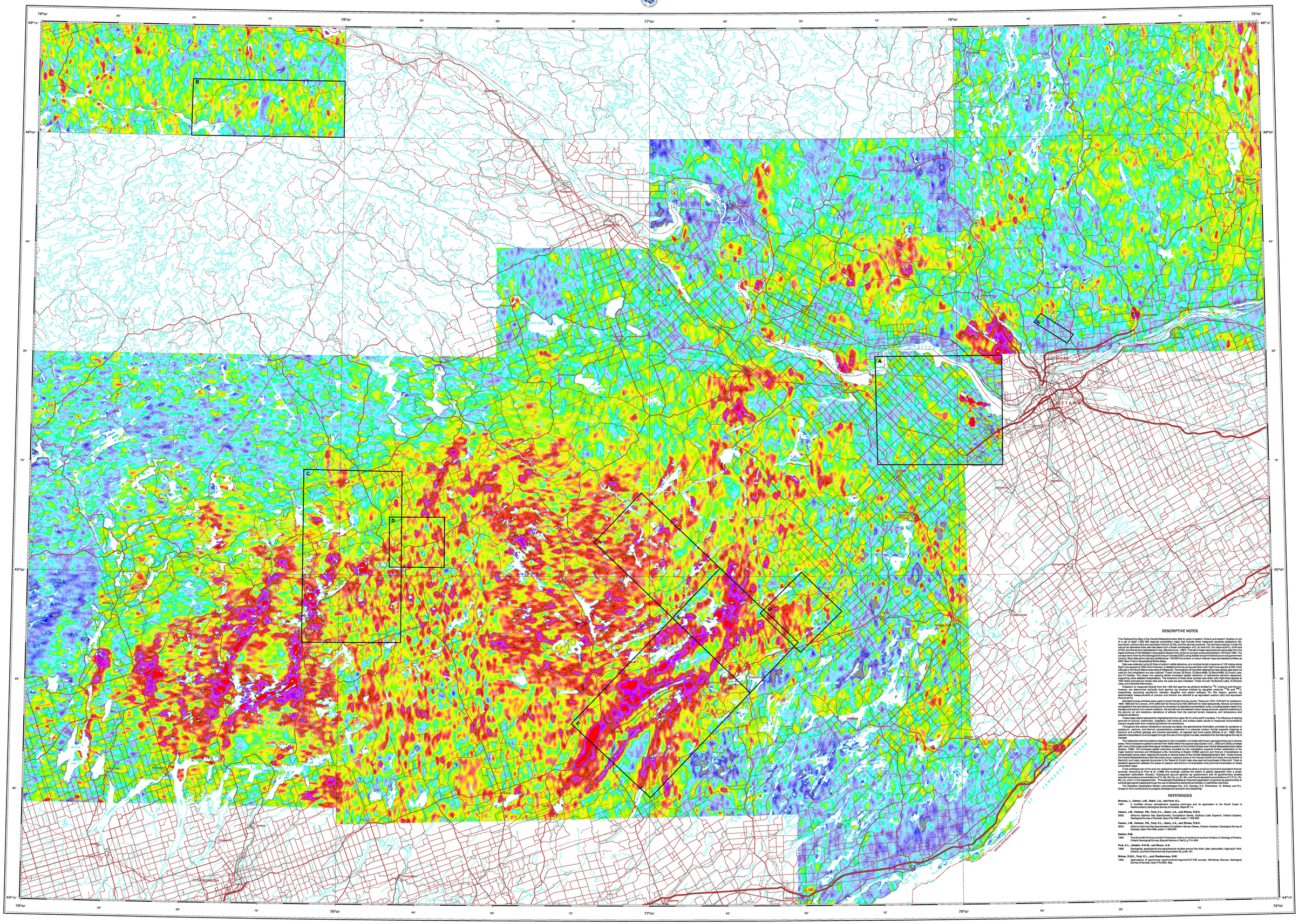
NATIGAM



DESCRIPTIVE NOTES

This Radioactivity Map of the Central Metasedimentary Belt for parts of eastern Ontario and western Quebec is one of a set of eight 1:250 000 regional compilation maps that include three measured variables (potassium (K), equivalent uranium (eU) and equivalent thorium (eTh), and five derived products. The derived products include the eU/eTh ratio, the ternary radiometric map (Broome et al., 1987), the eU/K ratio, the eTh/K ratio, the eTh/eU ratio, the eTh/K and the ternary radiaelement map. (Broome et al., 1987). This set of maps was produced using data from the digital archives of the Radiation Geophysics Section from airborne surveys conducted between 1974 and 1984. The surveys were flown by the Geological Survey of Canada (GSC) and by Geoterrex-Dighem under contract to the GSC funding. Most data were originally published as 1:50 000 line contour or contour interval maps and stacked profiles, as GSC Open Files or Geophysical Series Maps.

Data was collected using 50 litres of sodium iodide detectors, at a nominal terrain clearance of 120 metres along flight lines spaced at 1000 metre intervals. A detailed airborne survey was flown with flight lines spaced at 800 metre intervals over the Bancroft area (Carson et al., 2002). Data from 7 other 1000 metre line spacing surveys were also used for this compilation are also outlined. These include: 5) Brent, C) Bancroft, D) Bancroft/BL, E) Crotch Lake, and F) Cardiey. The closer line spacing allows increased spatial resolution of radioactive element signatures, which are important in mineral exploration. Data from 2 other surveys with line spacings greater than the standard 1000 metre intervals but whose data were not used are also indicated. These include G) Barriere Lake, H) Sharbot Lake, and I) Sharbot Pathmaster.

Potassium is measured directly from the 1460 keV gamma ray photons emitted by ^{40}K. Uranium and thorium, however, are determined indirectly from gamma ray photons emitted by daughter products ^{214}Bi and ^{208}Tl, respectively, assuming that the series are in equilibrium. Because of this assumption, the results of the spectrometric measurements of uranium and thorium are referred to as equivalent uranium (eU) and equivalent thorium (eTh).

Three energy windows were used to record the gamma ray counts. These are 1370–1570 keV for potassium, 1660–1860 keV for uranium, 2410–2810 keV for thorium and 400–2810 keV for total radioactivity. Several corrections are applied to the raw window counts prior to conversion to standard concentration units, including system dead time, background activity from cosmic radiation, the aircraft and atmospheric radon decay products, spectral scattering in the ground, air and detectors, deviations of altitude from the planned terrain clearance, and temperature and pressure variations.

These maps depict radioactivity originating from the upper 30 cm of the earth's surface. The influence of varying amounts of outcrop, overburden, vegetation, soil moisture, and surface water results in measured concentrations that are not intrinsic to the underlying bedrock formations alone.

Throughout the diverse Grenville/Elzevir terranes surveyed, the geochemical information provided by variations in potassium, uranium, and thorium concentrations presented in a coloured contour format supports mapping of bedrock and surficial geology and mineral exploration, at regional and local scales (Shives et al., 1993). More detailed interpretation is encouraged through the use of the original line data, available from the Geological Survey of Canada.

The radioactive element patterns depicted in this compilation correlate with known geological features in several areas. Reconnaissance patterns derived from 5000-metre line spaced data (Carson et al., 2002 and 2003) correlate well with the major lithotectonic boundaries recognized in the Central Metasedimentary Belt Boundary Zone (Easton, 1992). The increased spatial resolution provided by this compilation supports further subdivision of the major tectonic terranes and lithological units. According to Easton (1992) uranium and thorium mineralization is concentrated along major regional structures in several areas of the Central Metasedimentary Belt. These include the Central Metasedimentary Belt Boundary Zone, marginal areas of the Harvey-Cardiff Arch west and southwest of Bancroft, and the Grenville Supergroup rocks north of the Ottawa River between Ottawa and Mont Laurier. There is excellent agreement between the areas of uranium and thorium mineralization and prominent anomalies on these compilation maps.

In the Bancroft part of the area the radioactive element patterns show a small but prominent equivalent thorium anomaly. According to Ford et al. (1988) this anomaly outlines the extent of glacial dispersion from a small, unexposed carbonatite intrusion. Subsequent ground gamma ray spectrometry and 38 geochemistry studies reported anomalous concentrations of Ti, Ba, Nb, Ce, La, Zr, Mn, and Fe and elevated concentrations of Y, Cu, Pb, Mo, Co, and U in the dispersal train. This example illustrates an important application of gamma ray spectrometry to exploration for concealed rare earth element and niobium bearing carbonatite intrusions.

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eU/eTh ratio

OPEN FILE 4561

AIRBORNE GAMMA RAY SPECTROMETRY COMPILATION

CENTRAL METASEDIMENTARY BELT (GRENVILLE PROVINCE)

ONTARIO–QUEBEC

Scale 1:250 000/Échelle 1/250 000

kilometres 5 0 5 10 15 20 kilomètres

Transverse Mercator Projection
Central meridian 77°W, Scale Factor 0.9994
North American Datum 1927
© Her Majesty the Queen in Right of Canada 2004

Projection transverse de Mercator
Méridien central 77° W, facteur d'échelle 0.9994
Système de référence géodésique nord-américain, 1927
© Sa Majesté la Reine du chef du Canada 2004

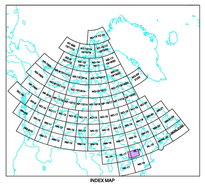
Geophysical compilation by J.M. Carson, P.B. Holman, K.L. Ford, J.A. Grant, and R.B.K. Shives

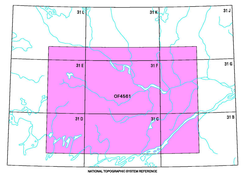
Digital cartography by J.A.Y. Pratt, Earth Sciences Sector Information Division (ESS Info)

This map was produced from processes in conformance with the Cartographic Services Section Quality Management System, Ottawa, registered to the Quality System ISO 9001: 2000 standard

Any revisions known to the user would be welcomed by the Geological Survey of Canada

Digital base map from data compiled by Geomatics Canada, modified by ESS Info





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2004

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Les dossiers publics sont des produits qui n'ont pas été soumis au processus officiel de publication de la CGC.

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Central Metasedimentary Belt, (Grenville Province), Ontario–Quebec;
Geological Survey of Canada, Open File 4561, scale 1:250,000

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