Energy, Mines and Resources Canada
Énergie, Mines et Ressources Canada

Geological Survey of Canada
Commission géologique du Canada

Resource Geophysics and Geochemistry Division

Province of Nova Scotia

Department of Mines and Energy

Mineral Resources Division

GSC Open File 846

DME Open File 481

RECONNAISSANCE AIRBORNE GAMMA RAY SPECTROMETRY

1:2 000 000 Coloured Compilation

Nova Scotia

11D, E, F, G, K; 20-O and 21 A, B, H

Prepared as a contribution to the Canada - Nova Scotia Cooperative Mineral Agreement 1981-84

1982

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PREPARED APRIL 1982

INTRODUCTION

The experimental 1:2,000,000 colour maps of airborne gamma ray spectrometric survey data contained in this Open File have been compiled from reconnaissance surveys flown by the Geological Survey of Canada in 1976, 1978 and 1979. Results of the surveys have been previously published as GSC Geophysical Series Maps and Open Files, compiled at a scale of 1:250,000 (see references).

Included in this Open File are maps of the total count, potassium, equivalent uranium, equivalent thorium and the gamma-ray exposure rates, which have been computer contoured and plotted utilizing an Applicon colour plotter.

Data acquisition, compilation, and publication of these results was funded by Canada, and this publication was prepared as a contribution to the Canada-Nova Scotia Co-operative Mineral Program 1981-84.

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The data compiled on these maps were acquired with the GSC high sensitivity gamma ray spectrometer, flown in a Short Bros. & Harland Skyvan aircraft, following the specifications used for the Federal Provincial Uranium Reconnaissance Program.

The airborne measurements were made using a 256 channel spectrometer, with 50,000 cm^3 of NaI(Tl) detectors, flown at a mean terrain clearance of 123 metres (400 ft.) and speed of 190 km/hr. Flight lines were at 5 km line spacing.

Potassium is measured directly from 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	^{40}K	1.37 - 1.57 MeV
Uranium	^{214}Bi	1.66 - 1.86 MeV
Thorium	^{208}Tl	2.41 - 2.81 MeV

Total count, uranium, thorium and potassium counts were measured over 1 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 are modified from those presented by Grasty (1972).

The corrected count rates were converted to radioelement concentrations using the following factors:

1% K	~ 91 cps
1 ppm eU	~ 9 cps
1 ppm eTh	~ 7 cps

Total count measurements are presented as units of radioelement concentration (Ur), as defined by IAEA (1976). The gamma ray exposure rates, in microRoentgens/hour (μR/hr), are calculated from the potassium, uranium and thorium concentrations in the ground (Lovborg and Kirkegaard, 1974).

Factors for converting airborne measurements to element concentration were determined by relating the corrected airborne count rates over the Breckenridge test strip in the Ottawa area to the known ground radioelement concentrations (R.L. Grasty and B.W. Charbonneau, 1974).

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 from which gamma radiation is detected, an area which may contain varying amounts of outcrop, overburden and surface water and biomass cover. 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 generally reflects the relative distribution of the elements in the bedrock.

REFERENCES

Geological Survey of Canada

1977: Airborne gamma-ray spectrometric map, Annapolis-Shelburne, Nova Scotia. N.T.S. 21A, 21B, 20O; Geol. Surv. Can. Geophysical Series Map No. 35121G.

1982(a): Airborne gamma-ray spectrometric map, Halifax, Nova Scotia. N.T.S. 11D; Geol. Surv. Can. Geophysical Series Map No. 35411G.

1982(b): Airborne gamma-ray spectrometric map, Truro, Nova Scotia. N.T.S. 11E; Geol. Surv. Can. Geophysical Series Map No. 35511G.

1982(c): Airborne gamma-ray spectrometric map, Canso, Nova Scotia. N.T.S. 11F; Geol. Surv. Can. Geophysical Series Map No. 35611G.

1982(d): Airborne gamma-ray spectrometric map, Amherst, Nova Scotia. N.T.S. 21H; Geol. Surv. Can. Geophysical Series Map No. 35821G.

1982(e): Airborne gamma-ray spectrometric map, Sydney, Nova Scotia. N.T.S. 11K; Geol. Surv. Can. Open File No. 816.

Grasty, R.L.

1972: Airborne gamma spectrometry data processing manual; Geol. Surv. Can., Open File No. 109.

Grasty, R.L. and Charbonneau, B.W.

1974: Gamma-ray spectrometry calibration facilities; Geol. Surv. Can., Paper 74-1B, p. 69-71.

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Lovborg, L. and Kirkegaard, P.

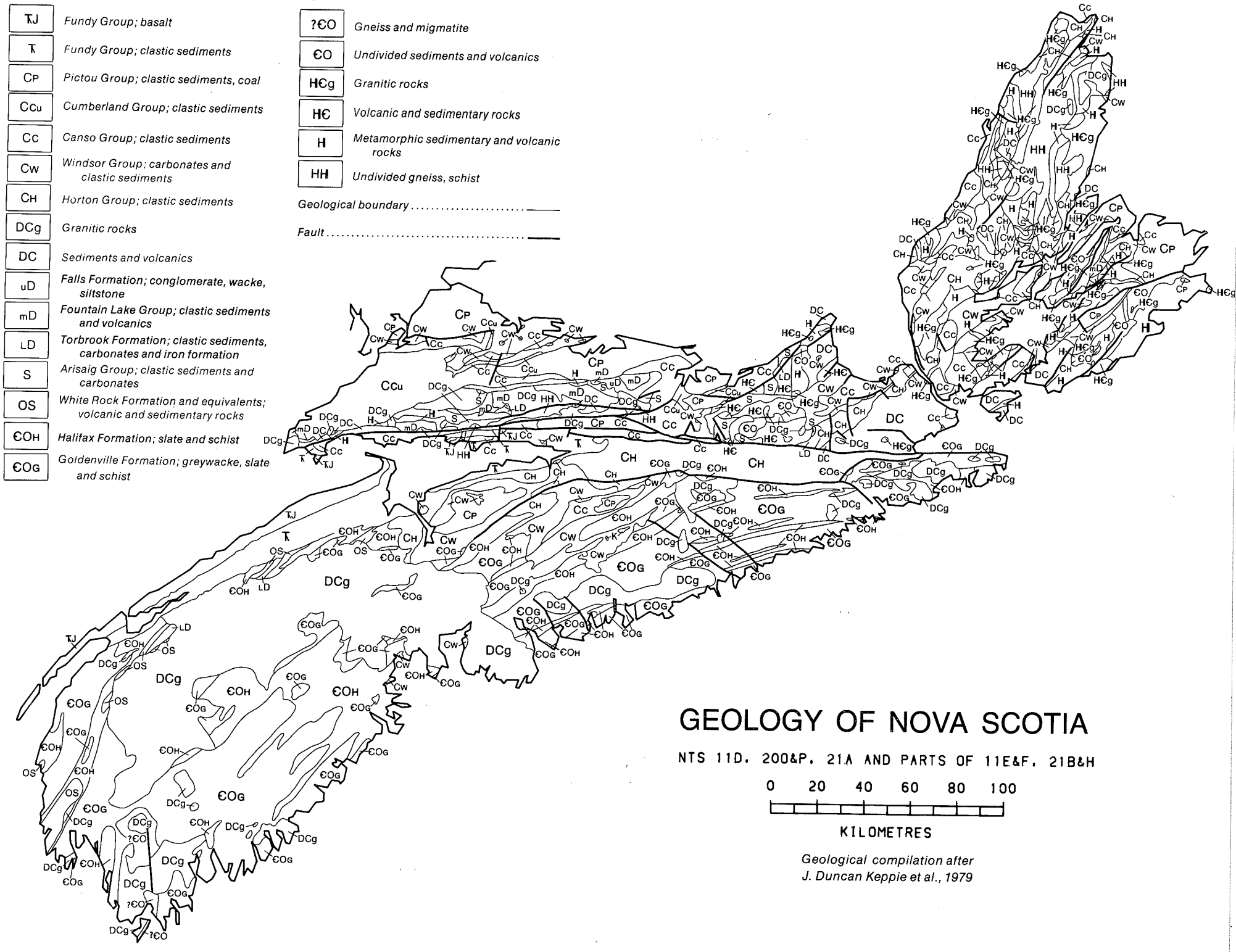
1974: Response of 3"x3" NaI(Tl) detectors to terrestrial gamma radiation; Nuclear Instruments and Methods 121, p. 239-251.

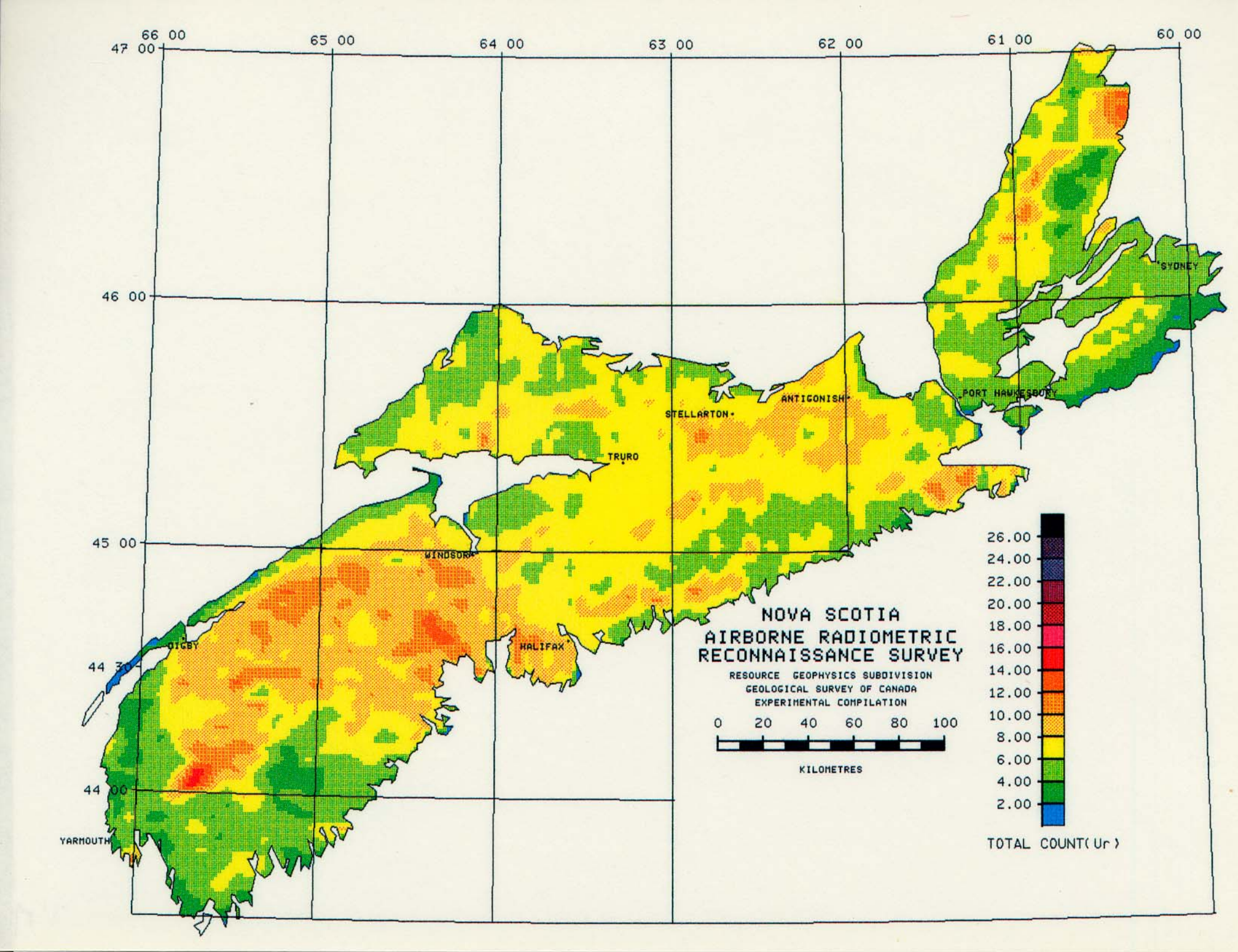
Airborne Survey Operations

P.B. Holman

Data Compilation

J.M. Carson and K.L. Ford


LEGEND
TJ Fundy Group; basalt
T Fundy Group; clastic sediments
CP Pictou Group; clastic sediments, coal
Ccu Cumberland Group; clastic sediments
Cc Canso Group; clastic sediments
Cw Windsor Group; carbonates and clastic sediments
CH Horton Group; clastic sediments
DCg Granitic rocks
DC Sediments and volcanics
uD Falls Formation; conglomerate, wacke, siltstone
mD Fountain Lake Group; clastic sediments and volcanics
LD Torbrook Formation; clastic sediments, carbonates and iron formation
S Arisaig Group; clastic sediments and carbonates
OS White Rock Formation and equivalents; volcanic and sedimentary rocks
COH Halifax Formation; slate and schist
COG Goldenville Formation; greywacke, slate and schist
?CO Gneiss and migmatite
CO Undivided sediments and volcanics
HCg Granitic rocks
HC Volcanic and sedimentary rocks
H Metamorphic sedimentary and volcanic rocks
HH Undivided gneiss, schist
Geological boundary
Fault
GEOLOGY OF NOVA SCOTIA
NTS 11D, 200&P, 21A AND PARTS OF 11E&F, 21B&H
0 20 40 60 80 100
KILOMETRES
Geological compilation after
J. Duncan Keppie et al., 1979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AIRBORNE RADIOMETRIC
RECONNAISSANCE SURVEY
RESOURCE GEOPHYSICS SUBDIVISION
GEOLOGICAL SURVEY OF CANADA
EXPERIMENTAL COMPILATION
0 20 40 60 80 100
KILOMETRES
26.00
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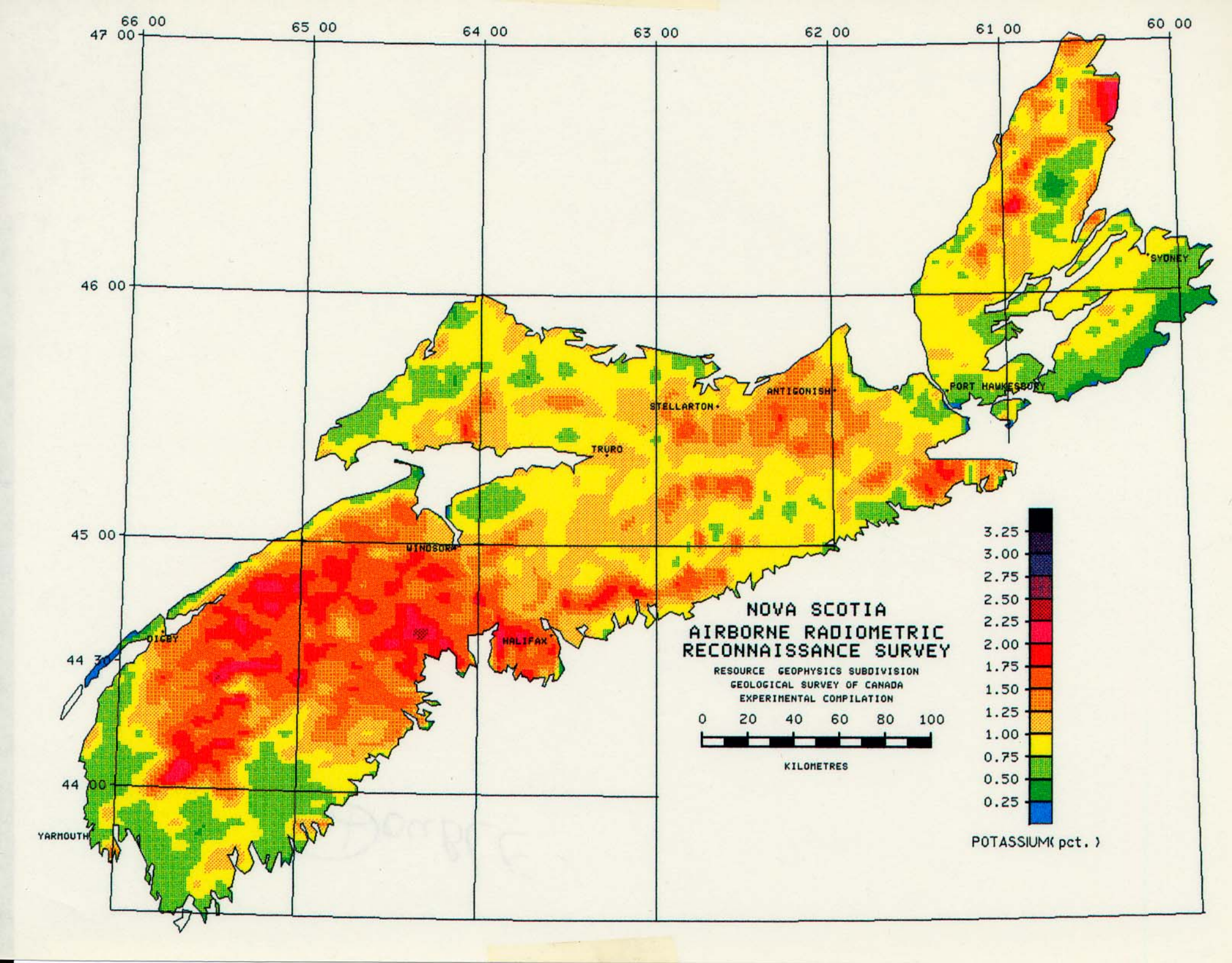
4.00
2.00
TOTAL COUNT(Ur)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GEOLOGICAL SURVEY OF CANADA
EXPERIMENTAL COMPILATION
0 20 40 60 80 100
KILOMETRES
3.25
3.00
2.75
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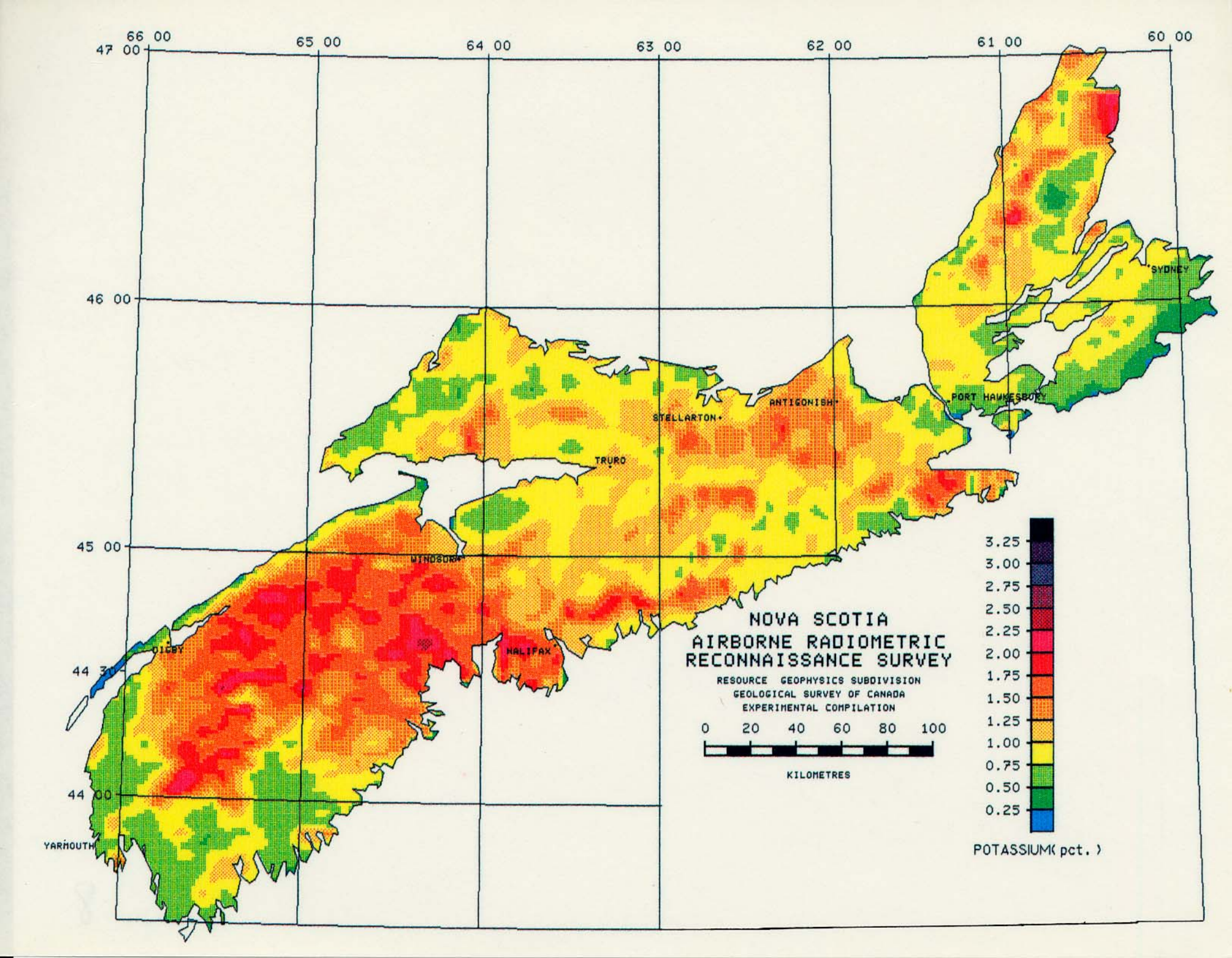
POTASSIUM(pct.)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EXPERIMENTAL COMPILATION
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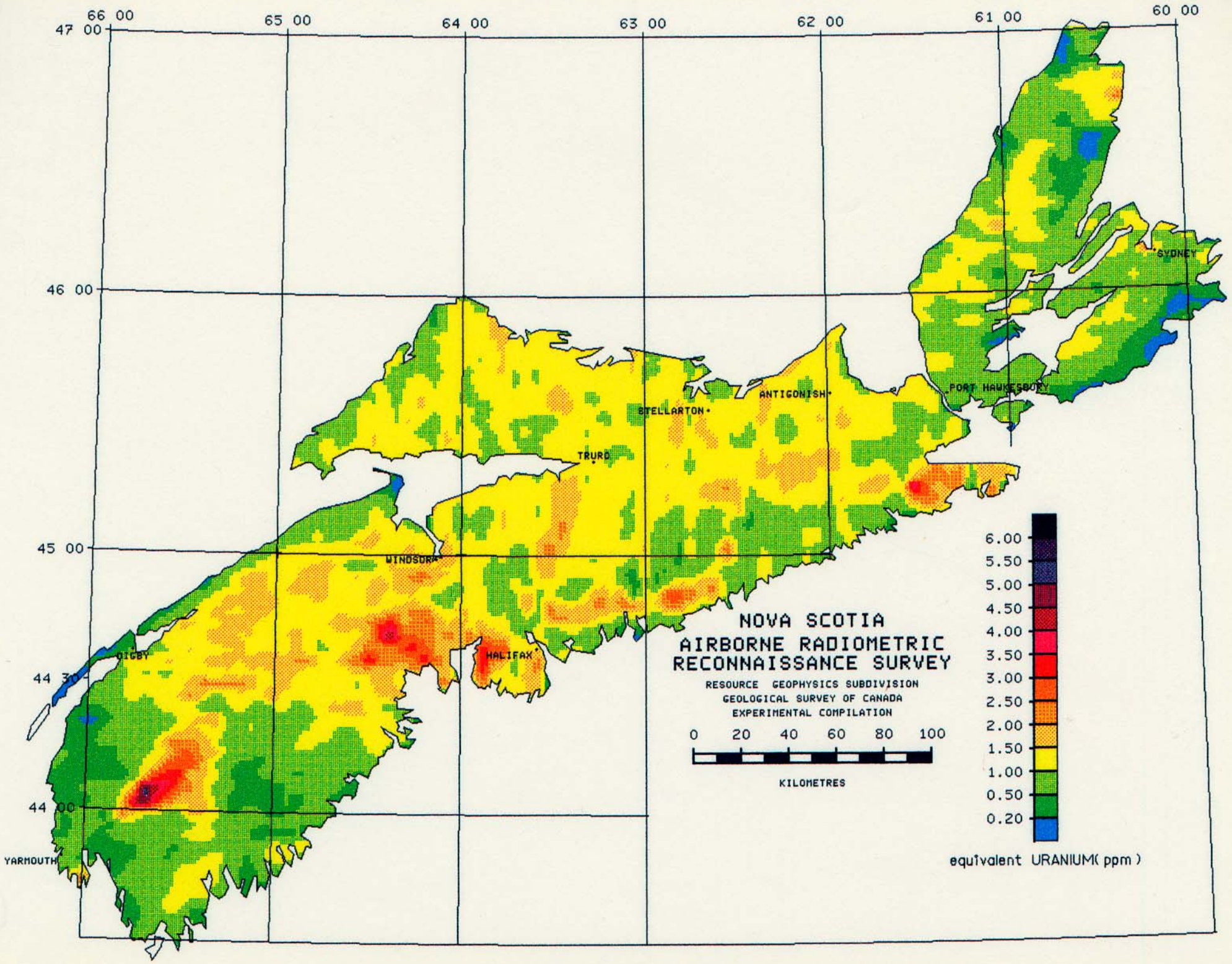
POTASSIUM(pct.)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EXPERIMENTAL COMPILATION
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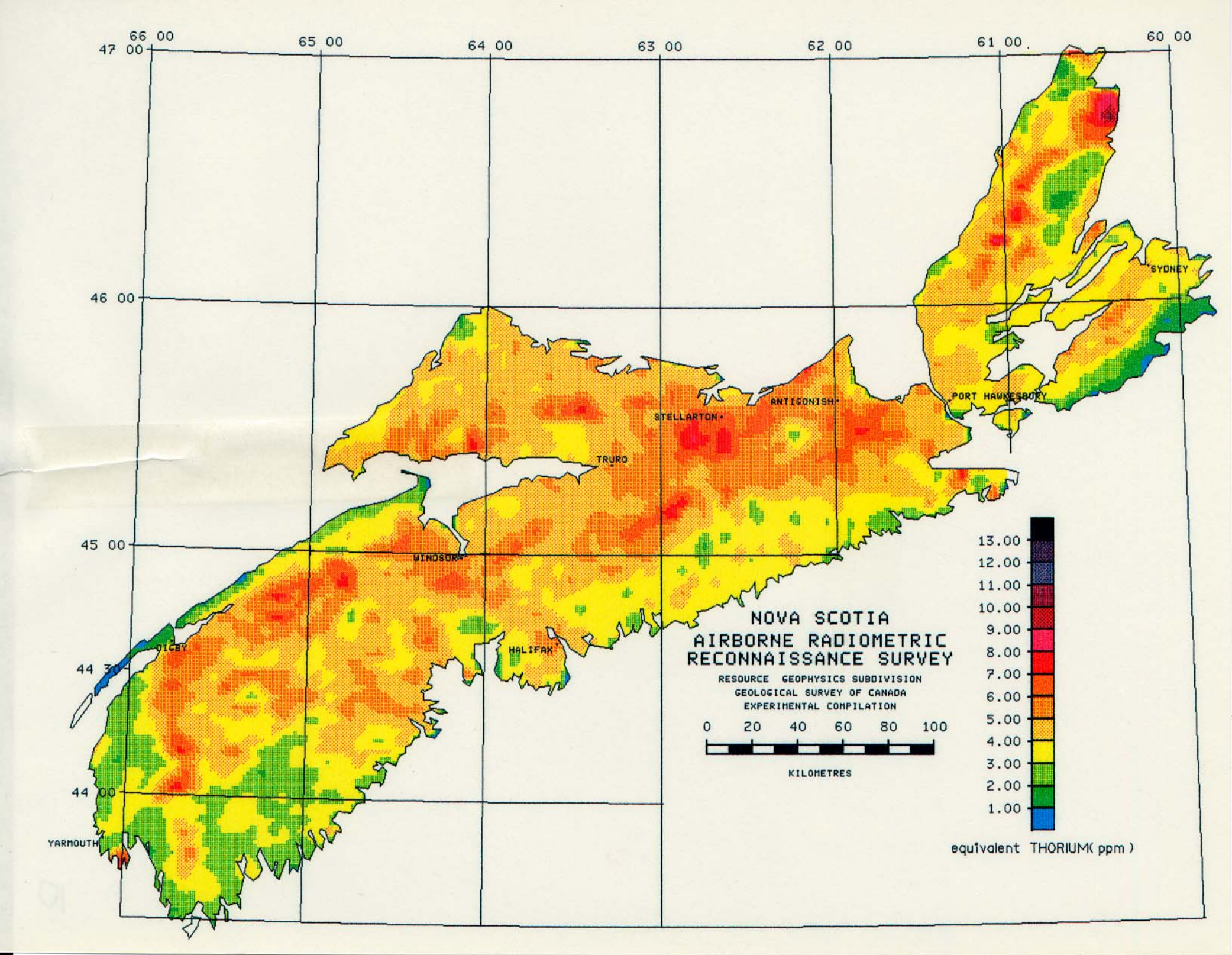
0.20
equivalent URANIUM(ppm)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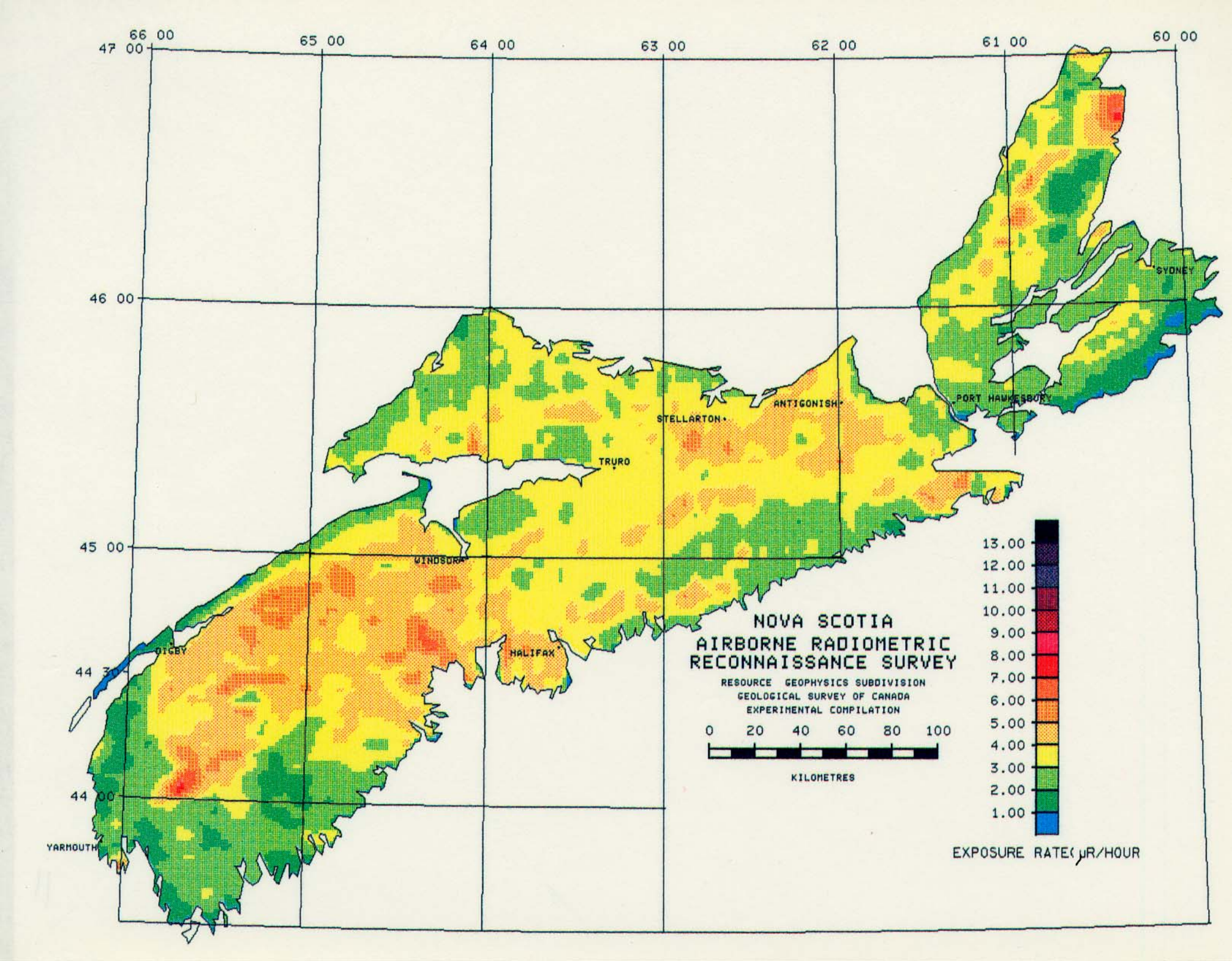
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