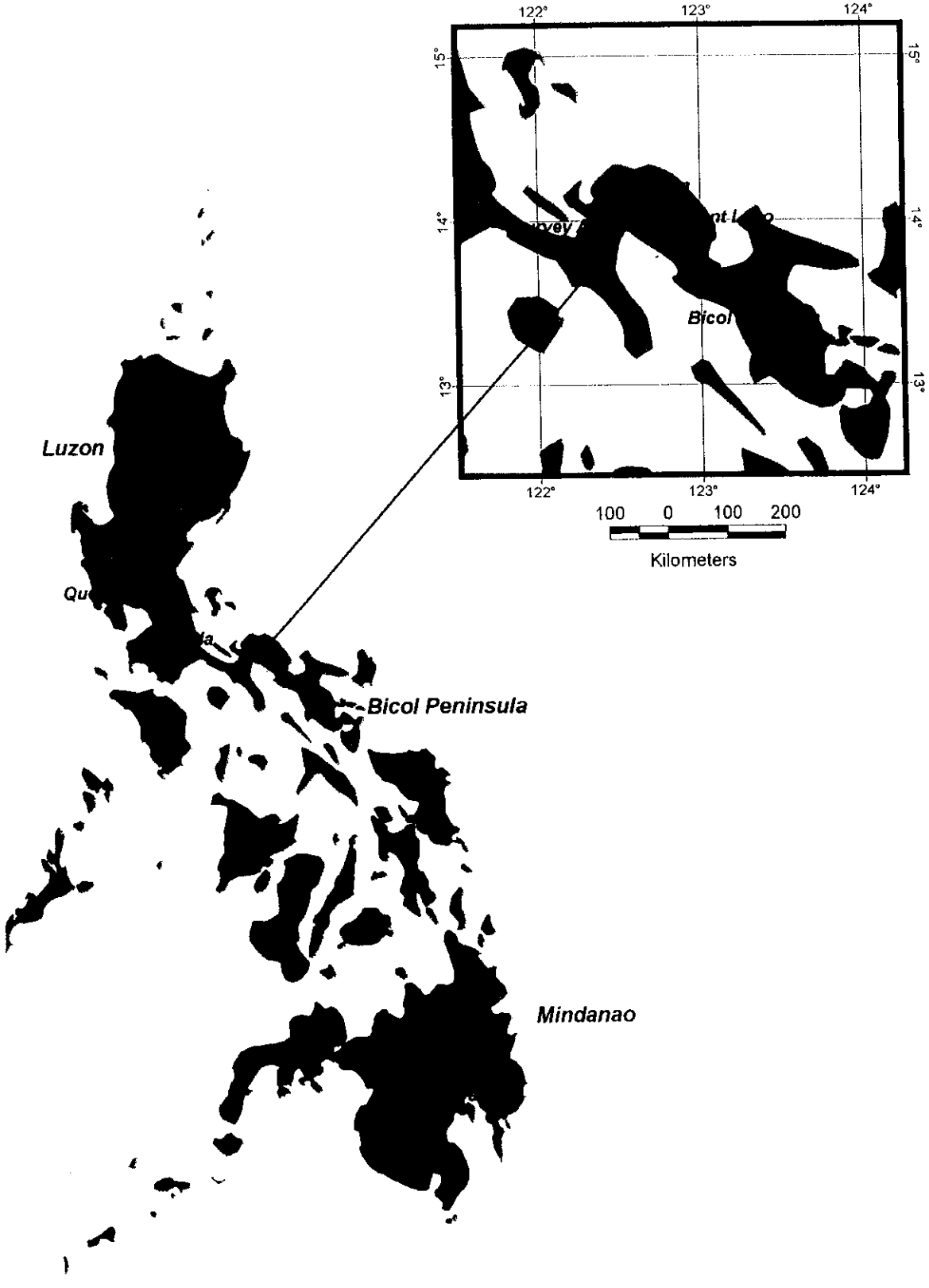


Figure 1 : Location Map for the Bicol North 2000 Airborne Geophysical Survey

FUGRO

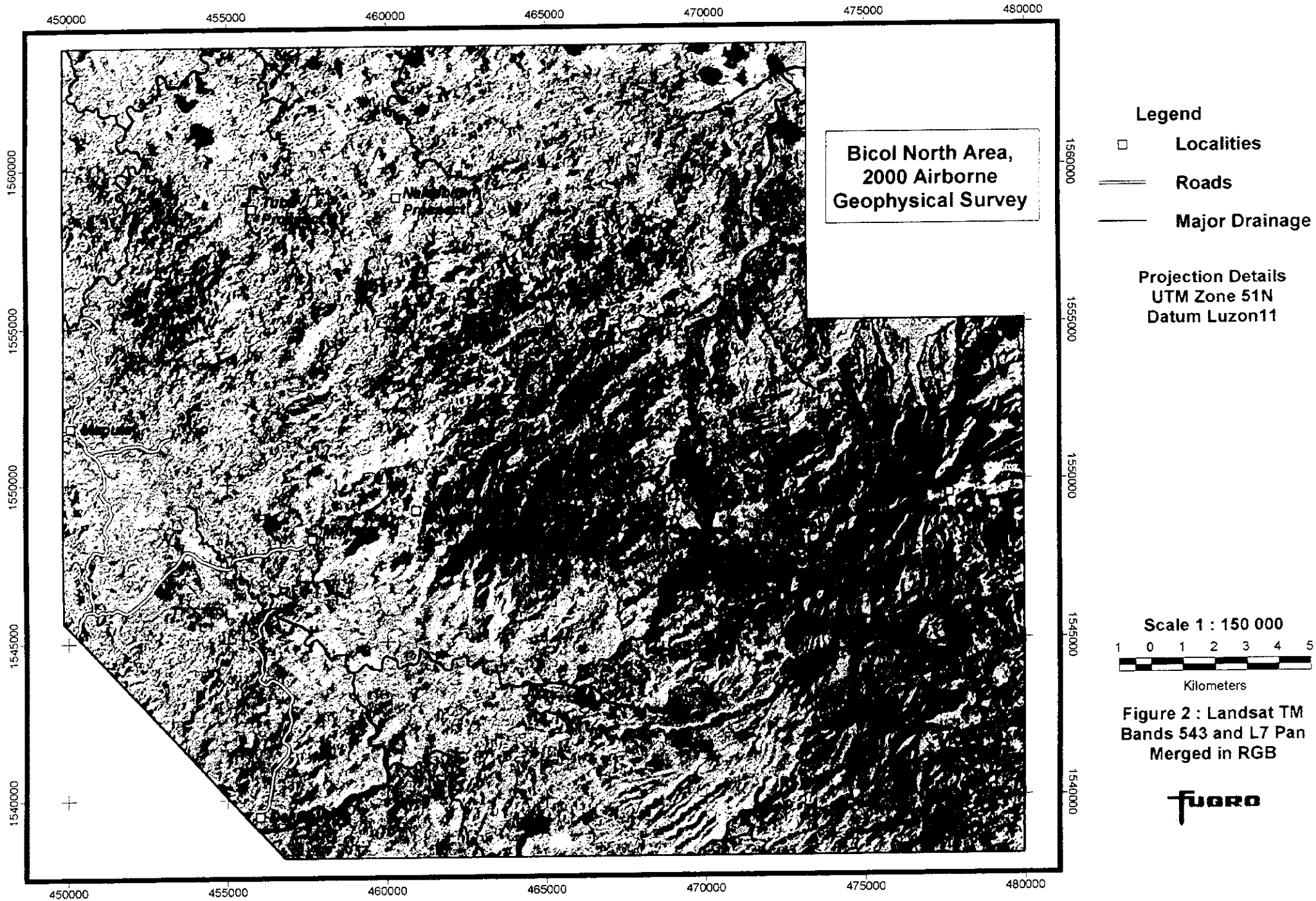
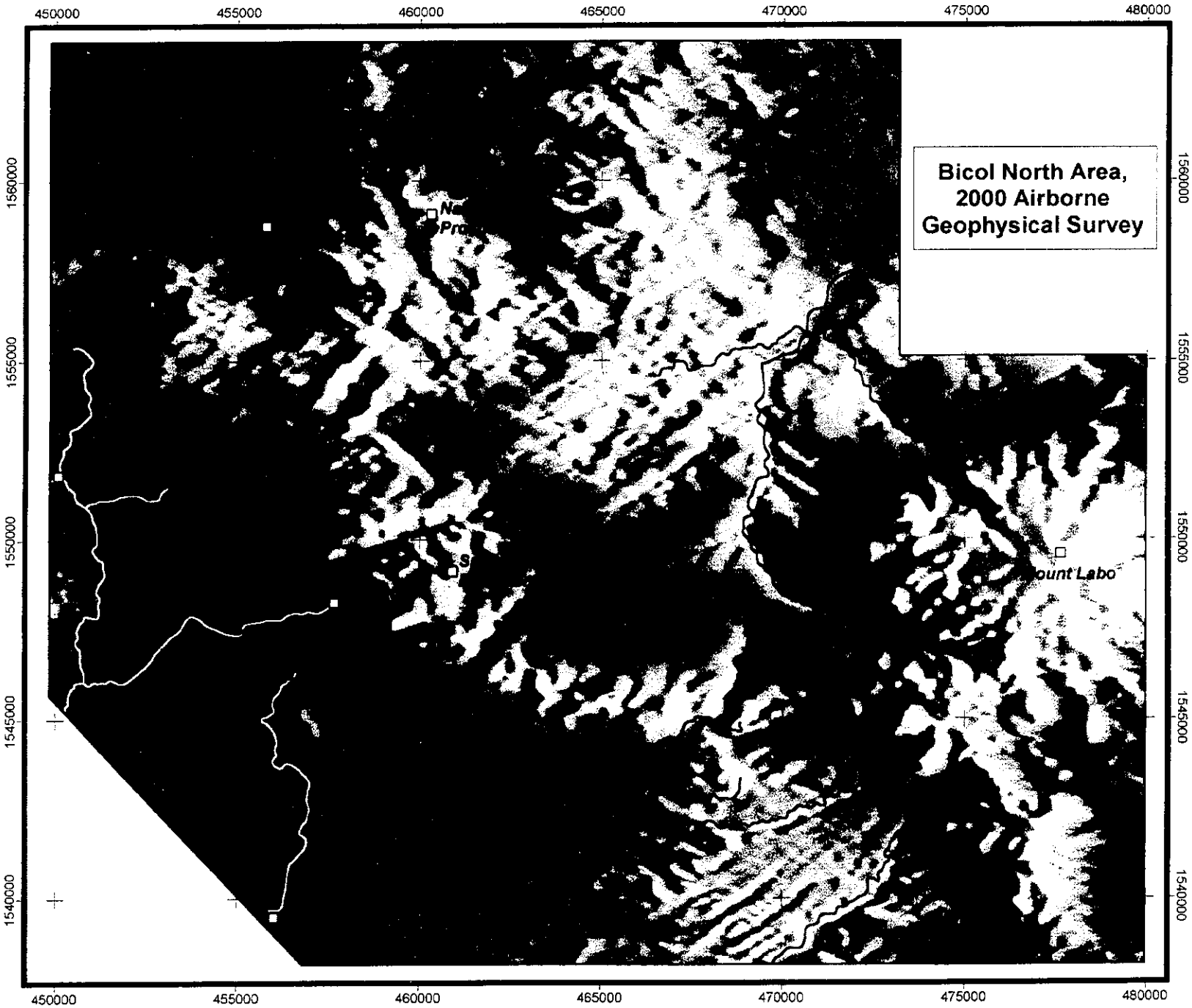


Figure 2 : Landsat TM Bands 543 and L7 Pan Merged in RGB

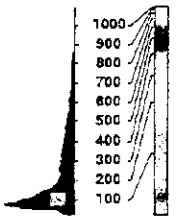
FUGRO



Legend

- Localities
- Roads
- Major Drainage

Projection Details
UTM Zone 51N
Datum Luzon11



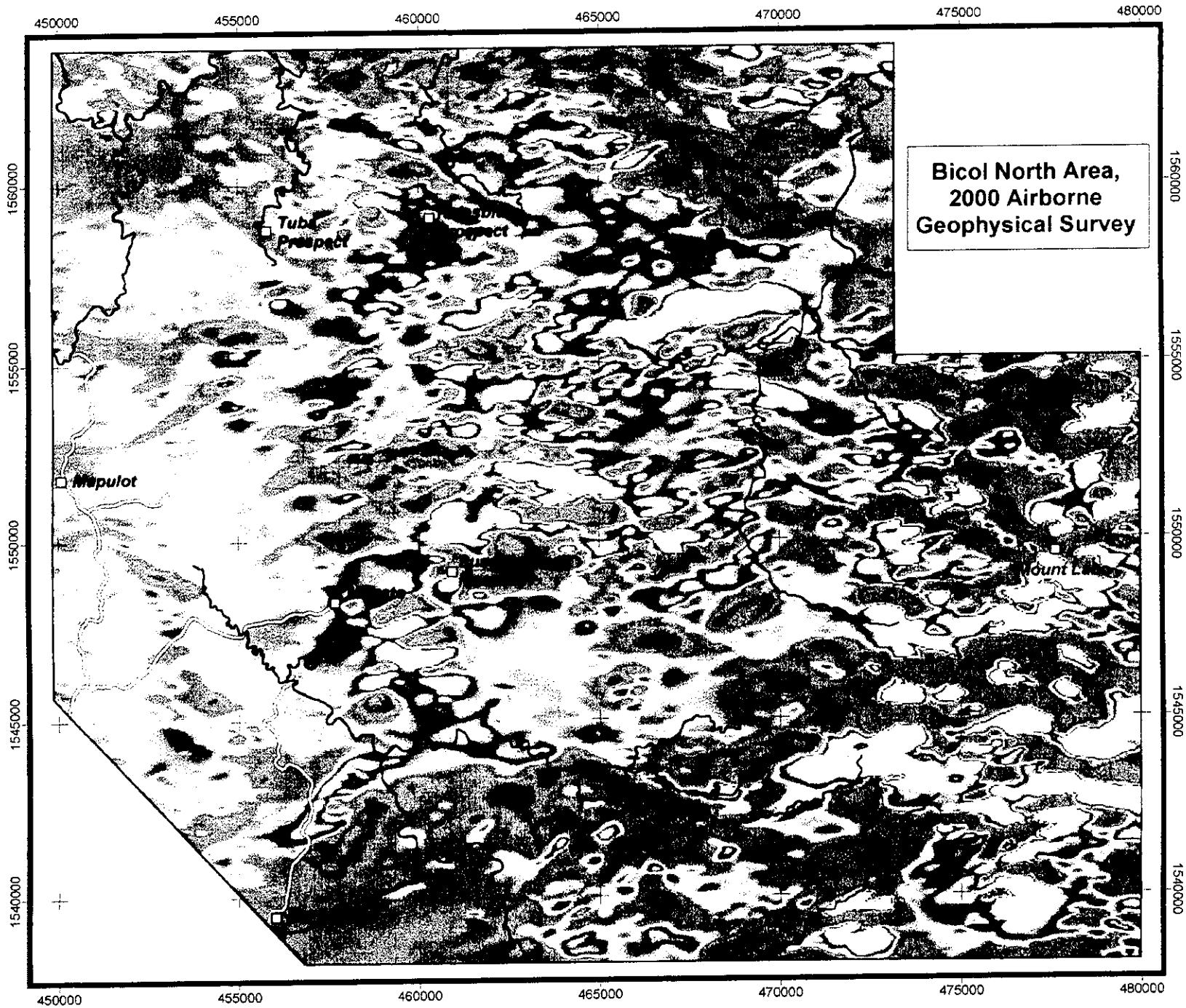
Scale 1 : 150 000

1 0 1 2 3 4 5

Kilometers

Figure 3
Digital Terrain Model
E Illumination

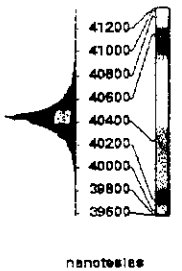
FUGRO



Legend

- Localities
- Roads
- Major Drainage

Projection Details
UTM Zone 51N
Datum Luzon11



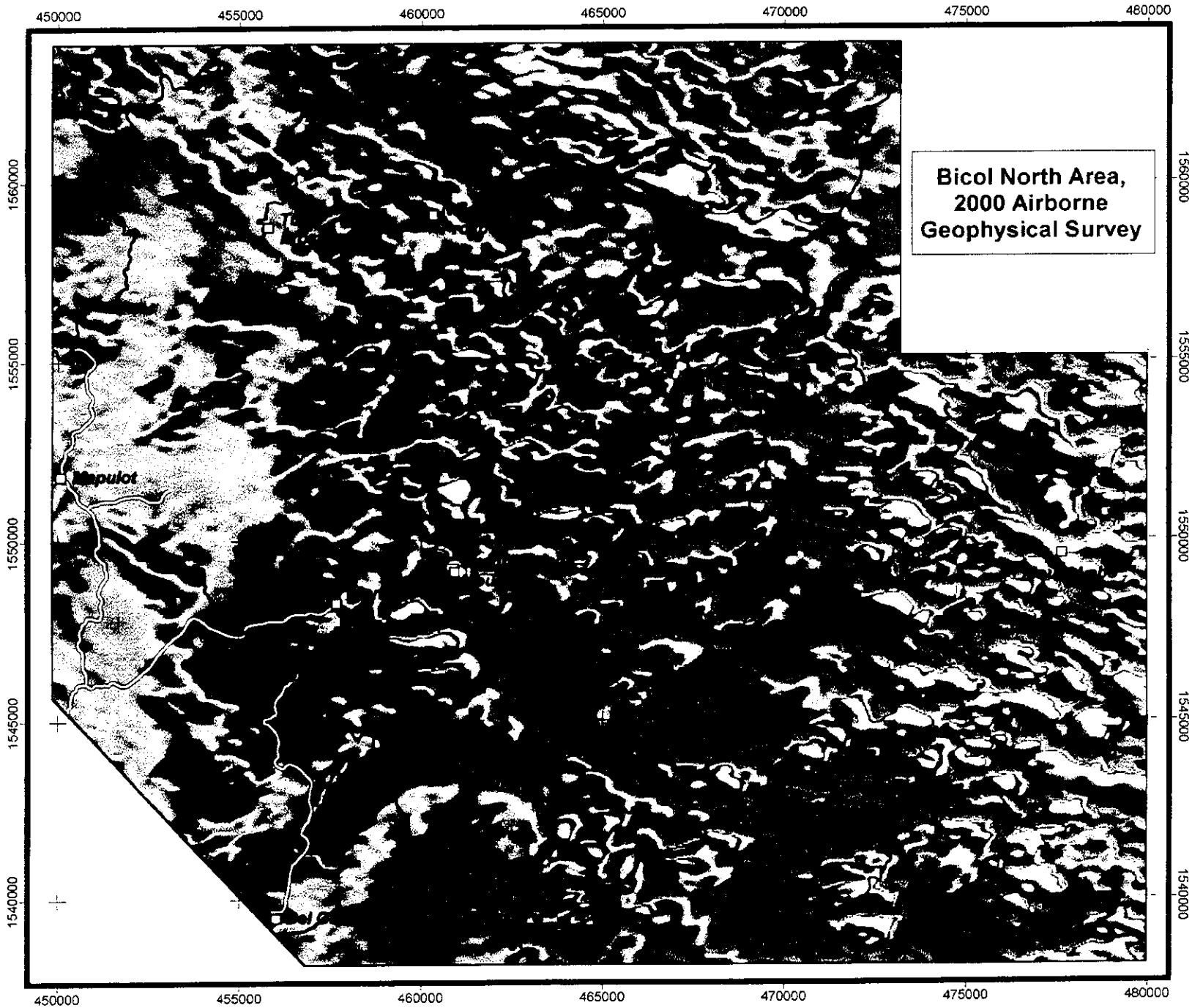
Scale 1 : 150 000

1 0 1 2 3 4 5

Kilometers

Figure 4
Total Magnetic Intensity

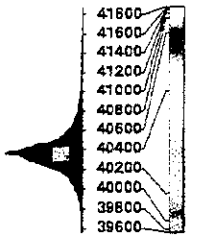
FUGRO



Legend

- Localities
- Roads
- Major Drainage

Projection Details
UTM Zone 51N
Datum Luzon11



nanoteslas

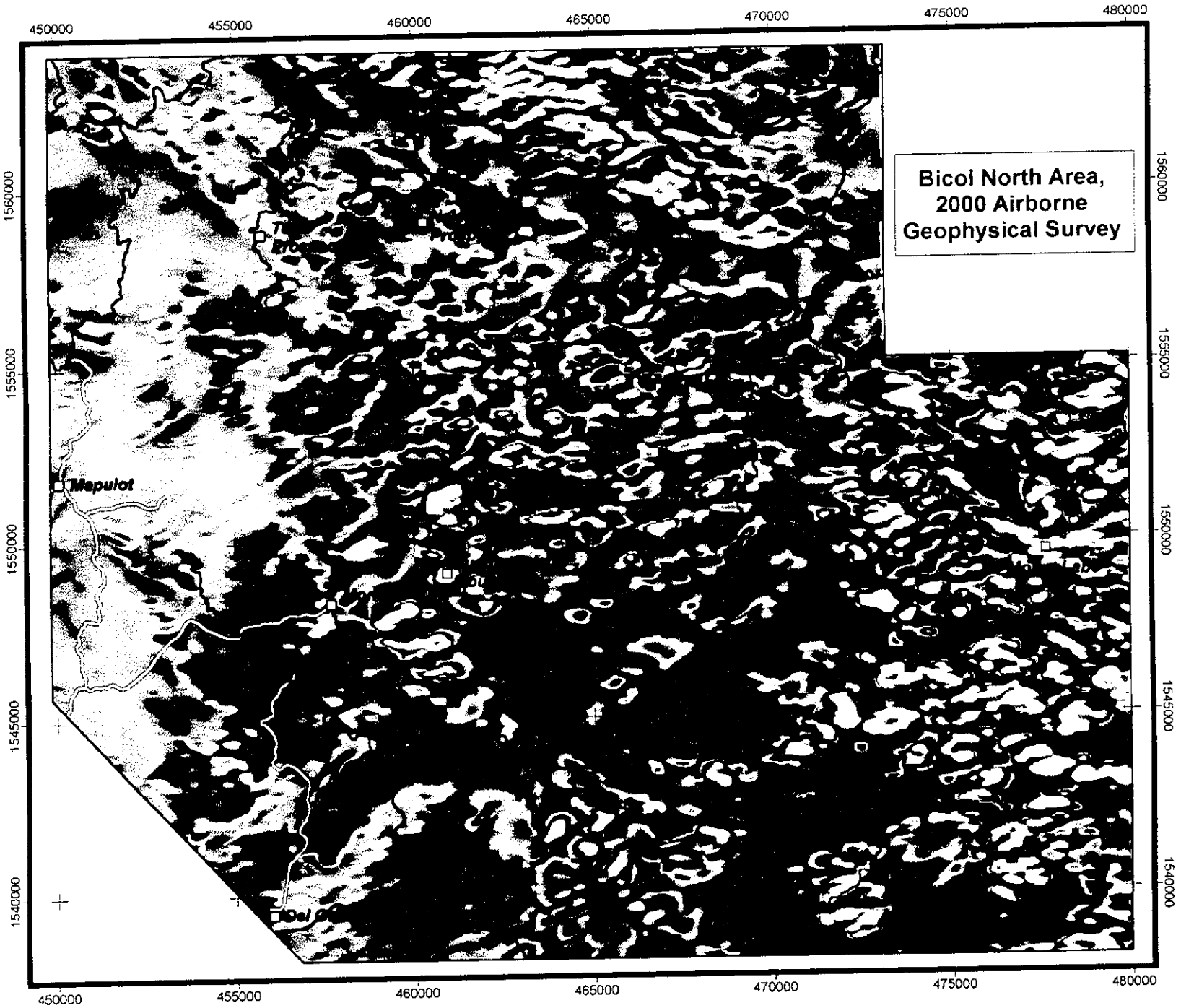
Scale 1 : 150 000

1 0 1 2 3 4 5

Kilometers

Figure 5
Total Magnetic Intensity
Reduced to Pole
NE Illumination

FUGRO



Legend

- Localities
- Roads
- Major Drainage

Projection Details
UTM Zone 51N
Datum Luzon11

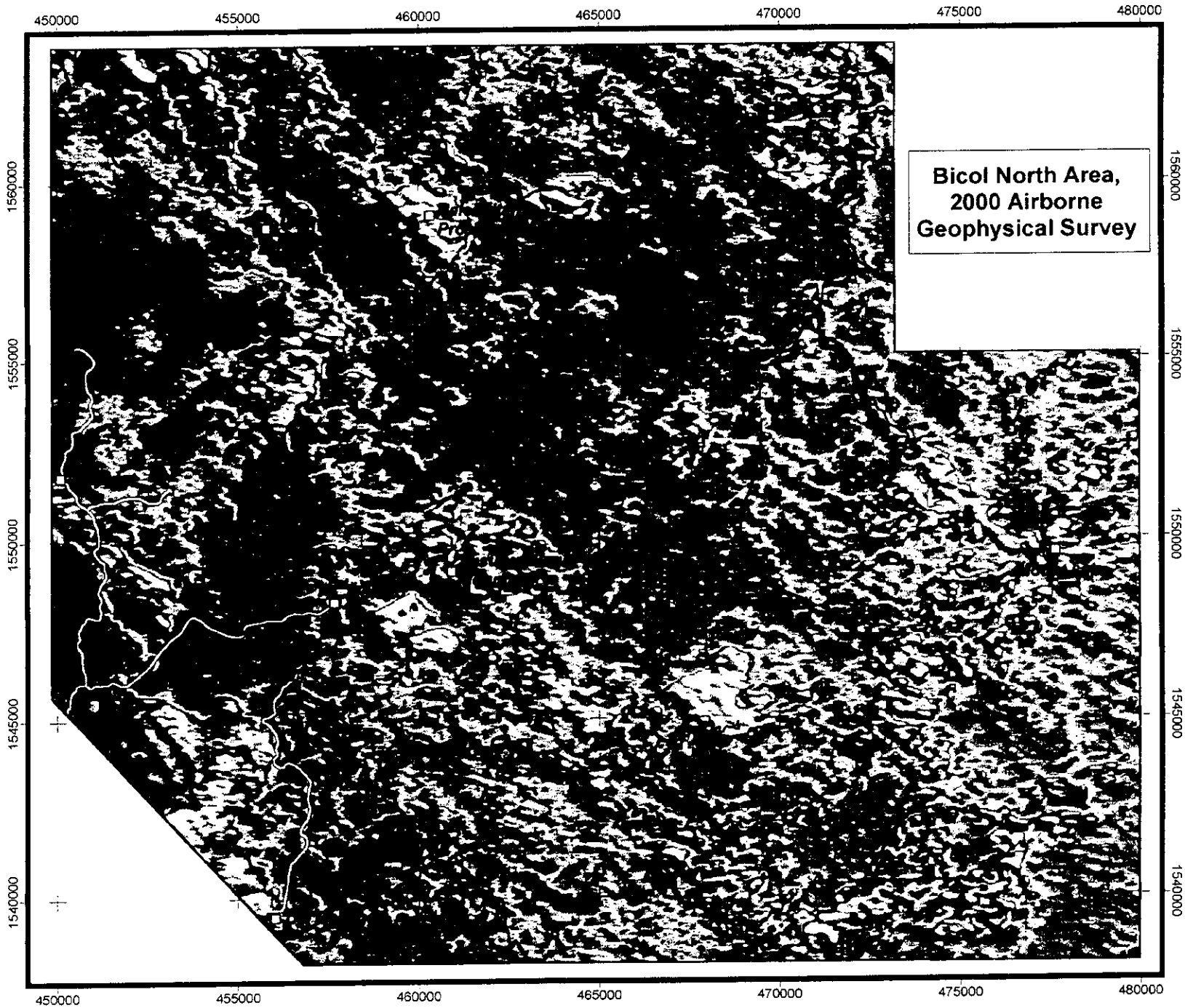
Scale 1 : 150 000

1 0 1 2 3 4 5

Kilometers

Figure 6
First Vertical Derivative of Total Magnetic Intensity (Reduced to Pole)

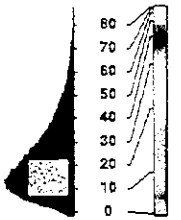
FUGRO



Legend

- Localities
- Roads
- Major Drainage

Projection Details
UTM Zone 51N
Datum Luzon11



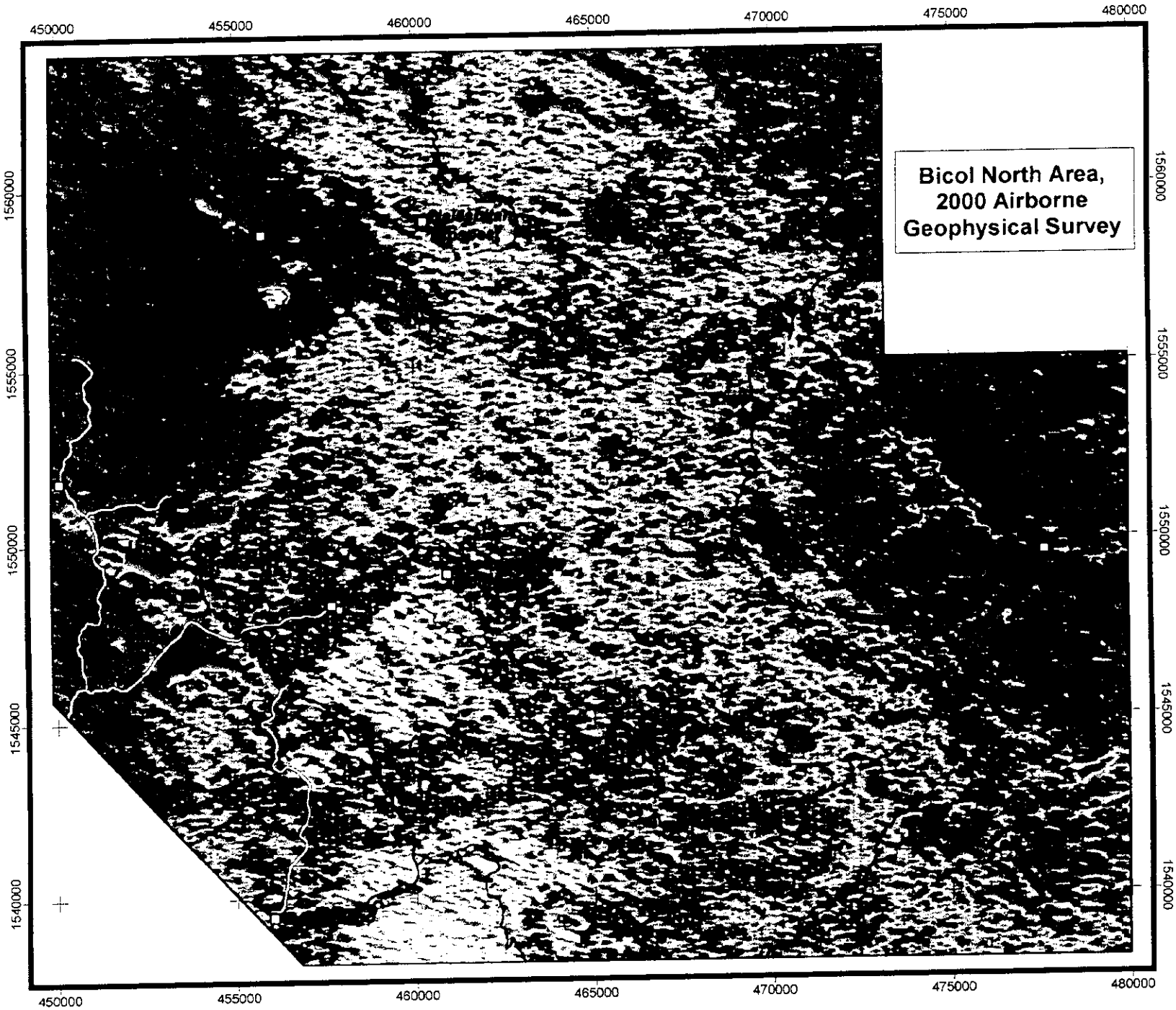
Scale 1 : 150 000

1 0 1 2 3 4 5

Kilometers

Figure 7
Potassium Gamma-ray Spectral Image
NE Illumination

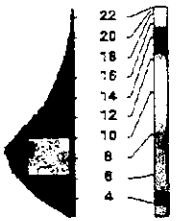
FUGRO



Legend

- Localities
- Roads
- Major Drainage

Projection Details
UTM Zone 51N
Datum Luzon11



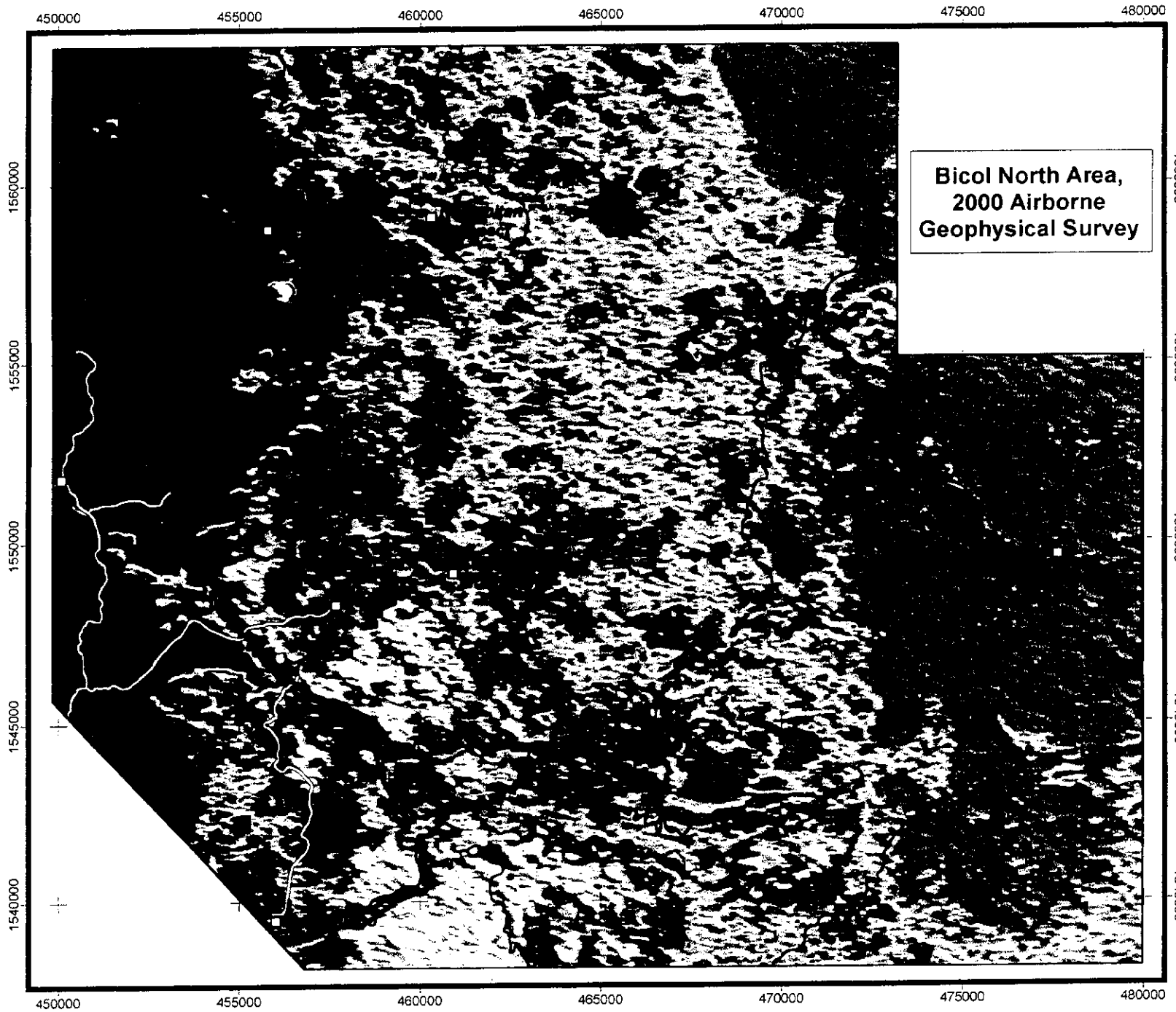
Scale 1 : 150 000

1 0 1 2 3 4 5

Kilometers

Figure 8
Uranium Gamma-ray Spectral Image
NE Illumination

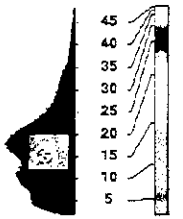
FUGRO



Legend

- Localities
- Roads
- Major Drainage

Projection Details
UTM Zone 51N
Datum Luzon11



counts per second

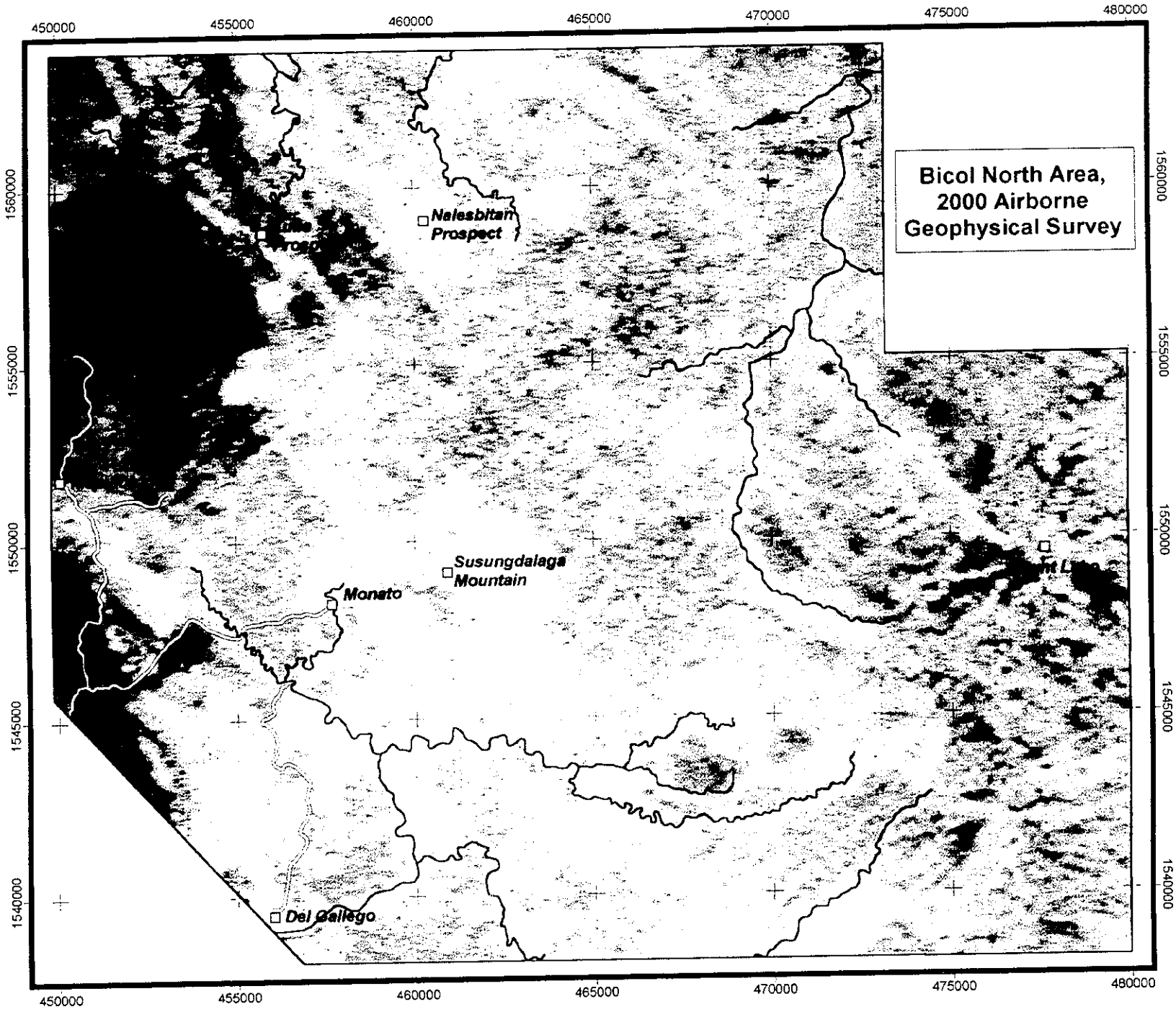
Scale 1 : 150 000

1 0 1 2 3 4 5

Kilometers

Figure 9
Thorium Gamma-ray
Spectral Image
NE Illumination

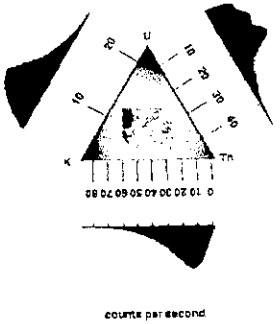
FUGRO



Legend

- Localities
- Roads
- Major Drainage

Projection Details
UTM Zone 51N
Datum Luzon11



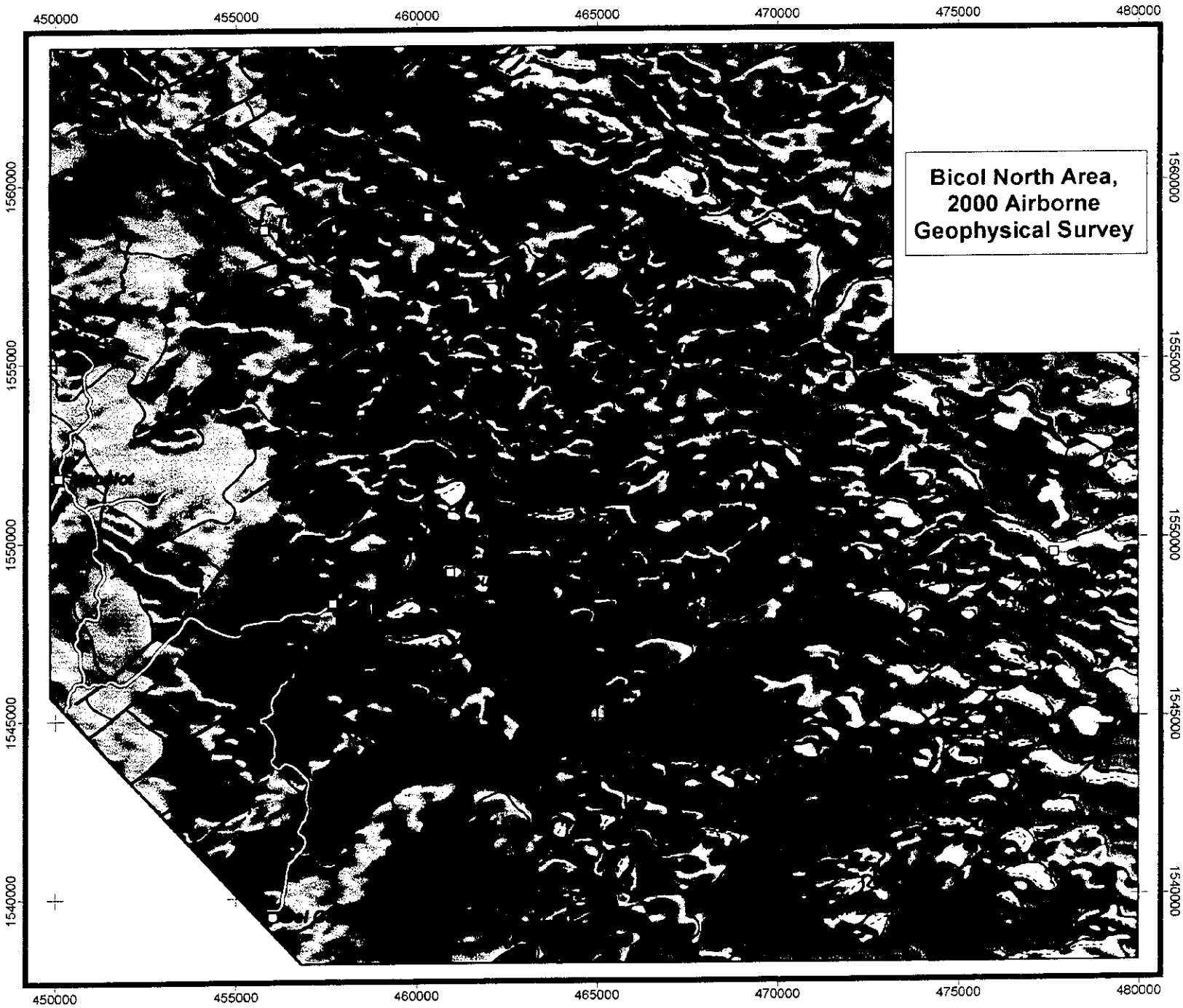
Scale 1 : 150 000

1 0 1 2 3 4 5

Kilometers

Figure 10
Potassium-Uranium-Thorium Ternary Gamma-ray Spectral Image

FUGRO



Legend

- Localities
- Roads
- Major Drainage

Projection Details
UTM Zone 51N
Datum Luzon11

Geological - Geophysical Boundaries

- Geological - Geophysical Contact
- Fault
- Dyke
- Topographic Linear
- Magnetic Trend
- Survey Boundary

Scale 1 : 150 000

1 0 1 2 3 4 5

Kilometers

Figure 11
TMI-RTP with Superimposed Geophysical Interpretation

FUGRO

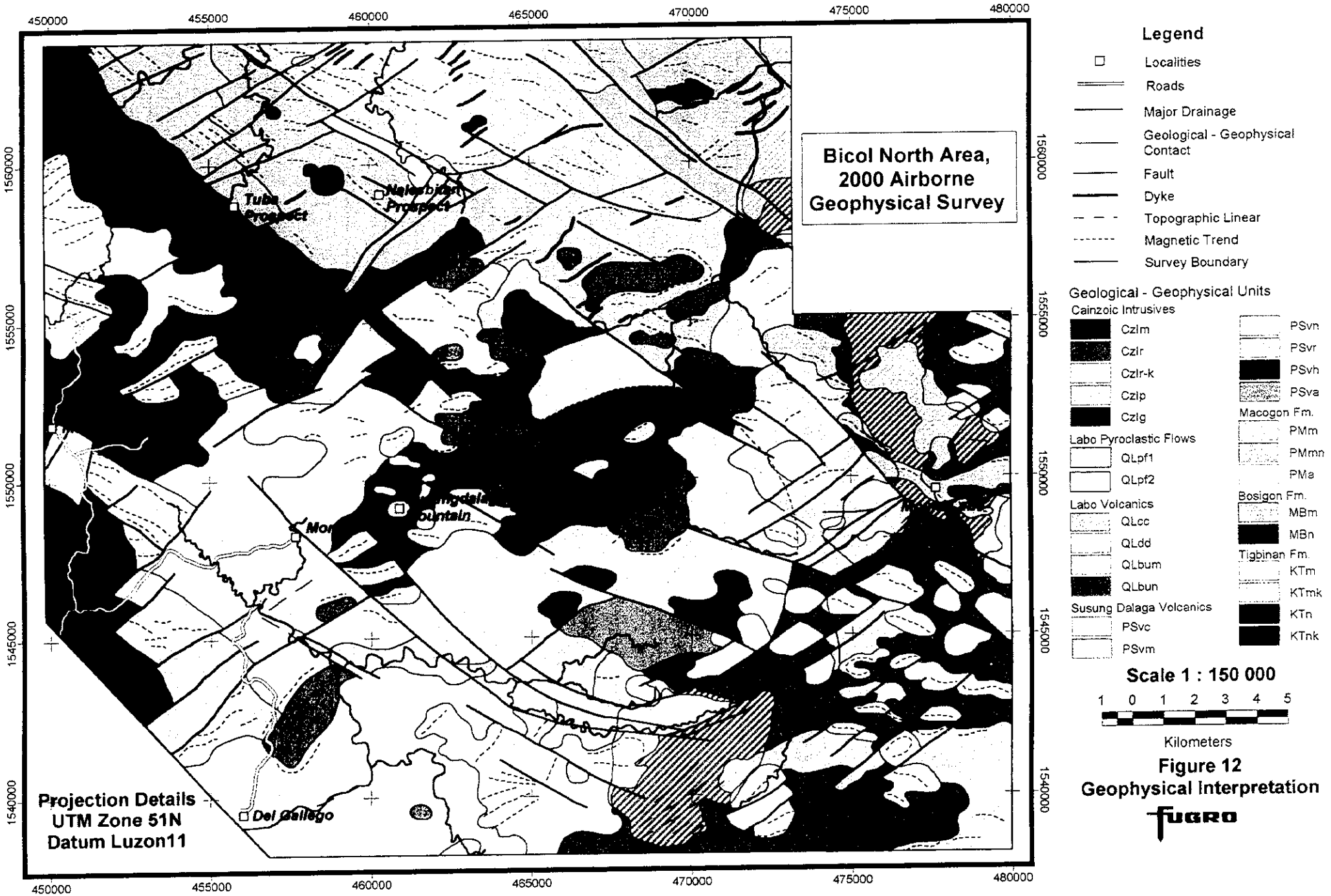
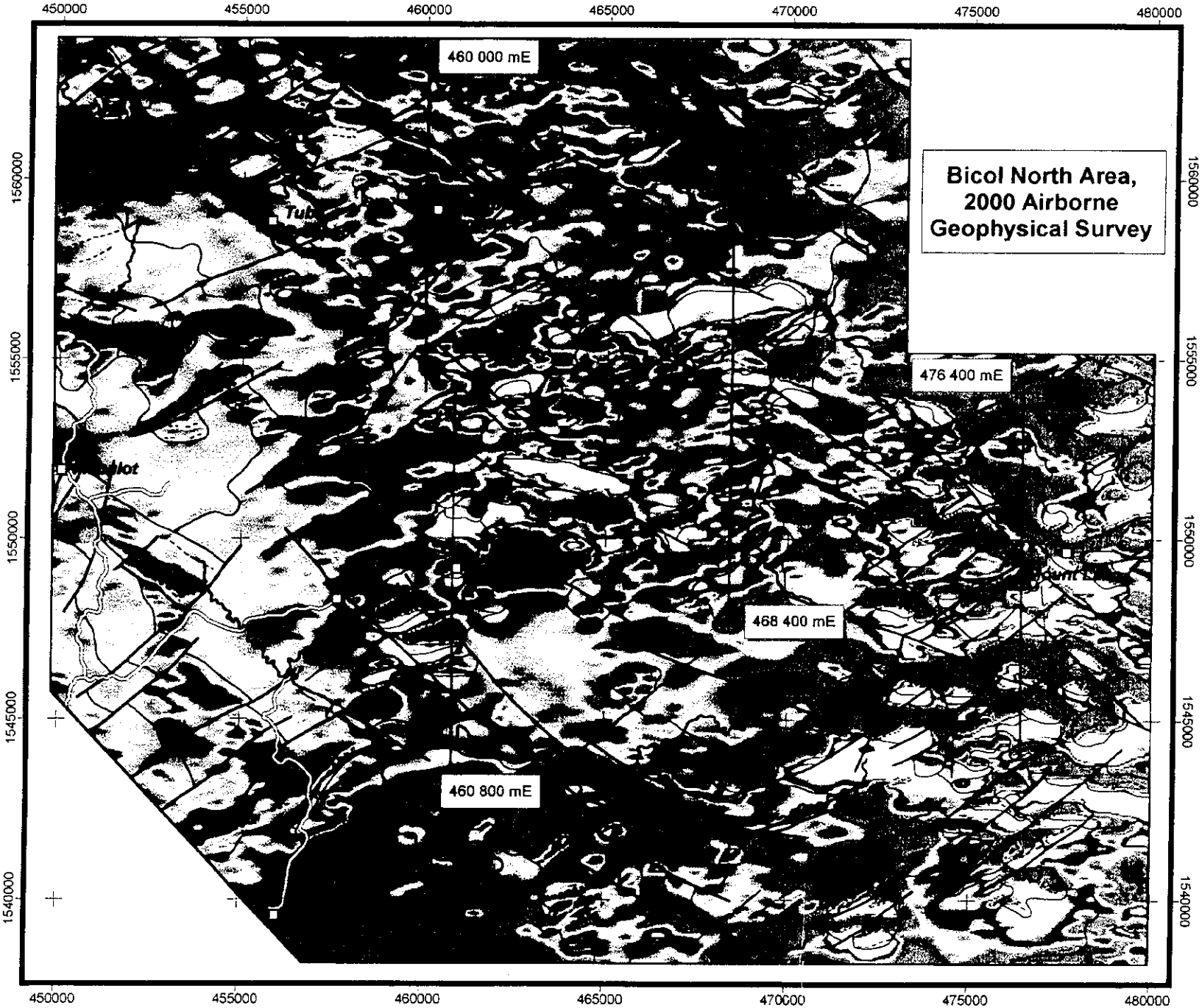


Figure 12
Geophysical Interpretation

FUGRO



Legend

- Localities
- Roads
- Major Drainage

Projection Details
UTM Zone 51N
Datum Luzon11

Geological - Geophysical Boundaries

- Geological - Geophysical Contact
- Fault
- Dyke
- Topographic Linear
- Magnetic Trend
- Survey Boundary

Scale 1 : 150 000

1 0 1 2 3 4 5

Kilometers

Figure 13
Total Magnetic Intensity with Model Profile Lines

FUGRO

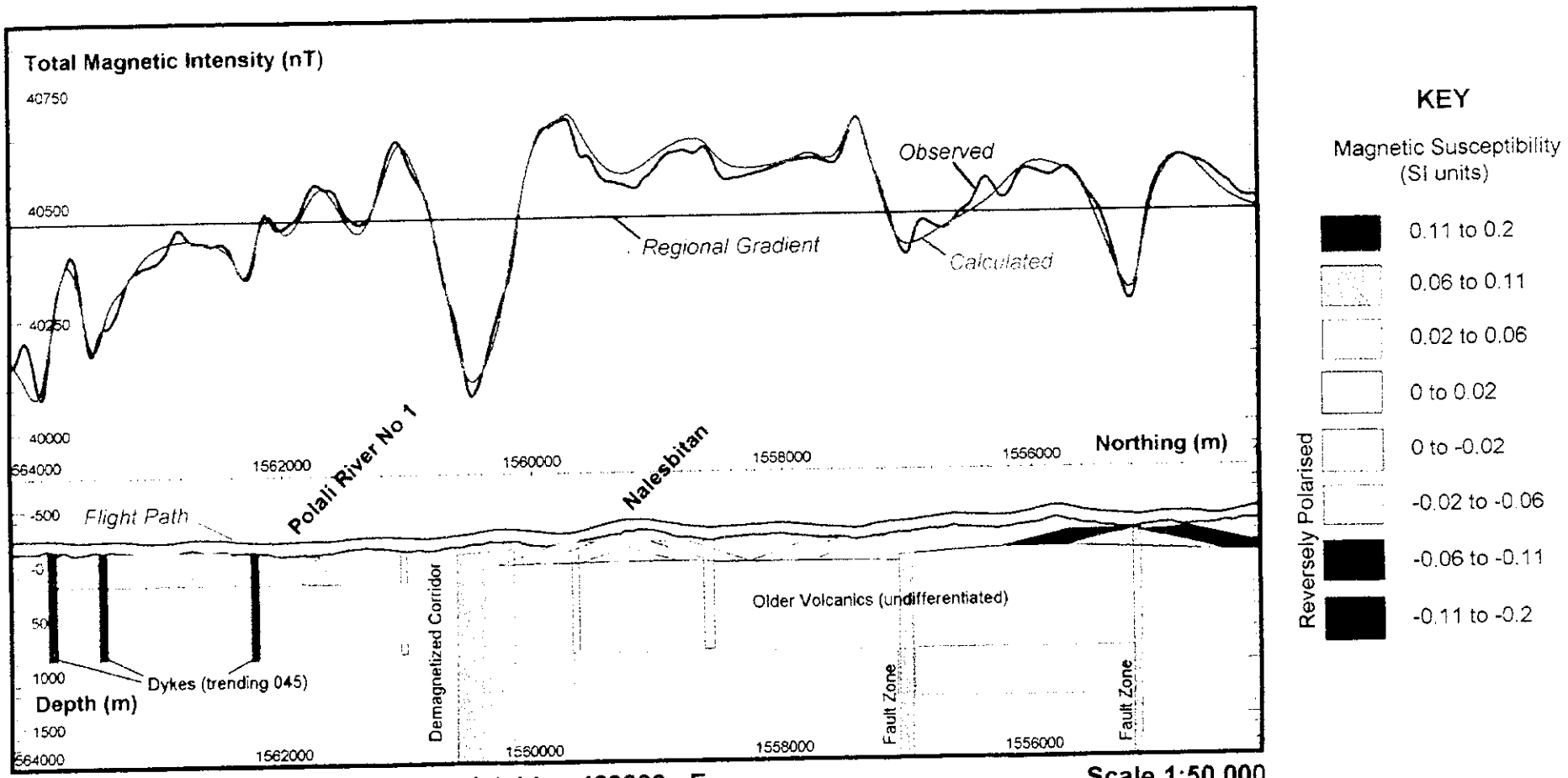


Figure 14: Interpreted magnetic model, Line 460000mE

Scale 1:50 000

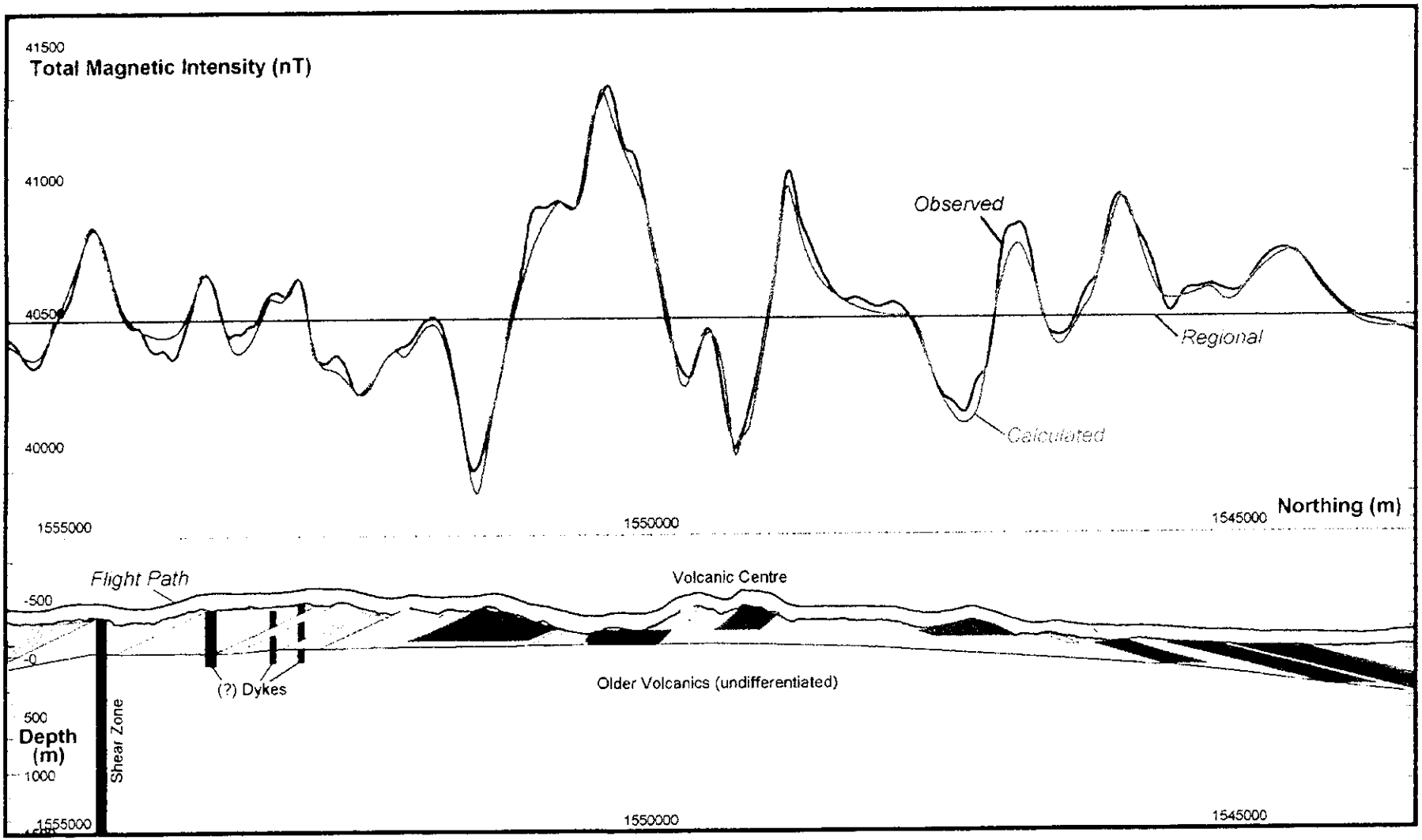


Figure 15: Interpreted magnetic model, Line 460800mE (see Fig. 14 for key to model colours) **Scale 1:50 000**

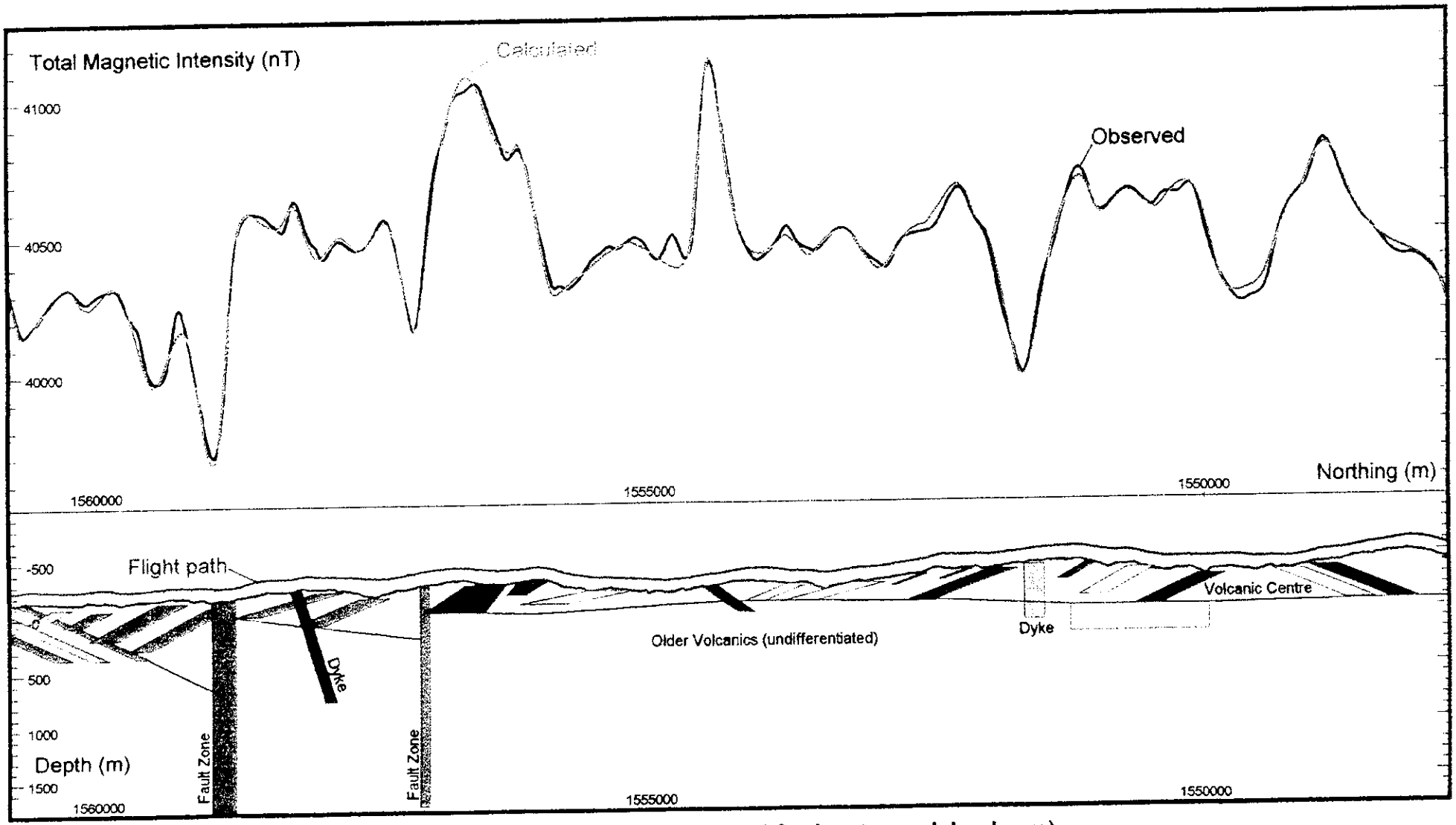


Figure 16: Interpreted magnetic model, Line 468400mE (see Fig. 14 for key to model colours)

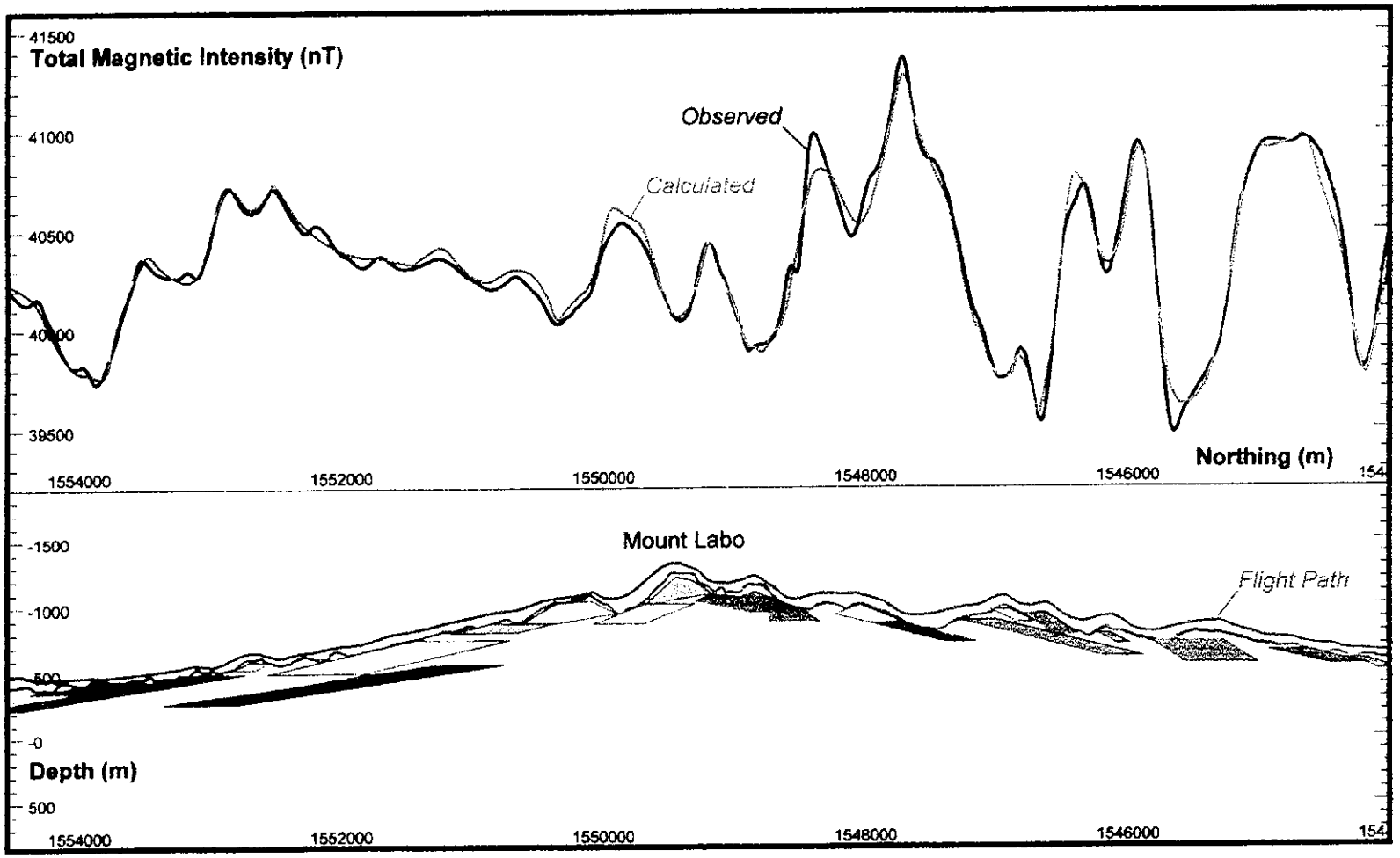
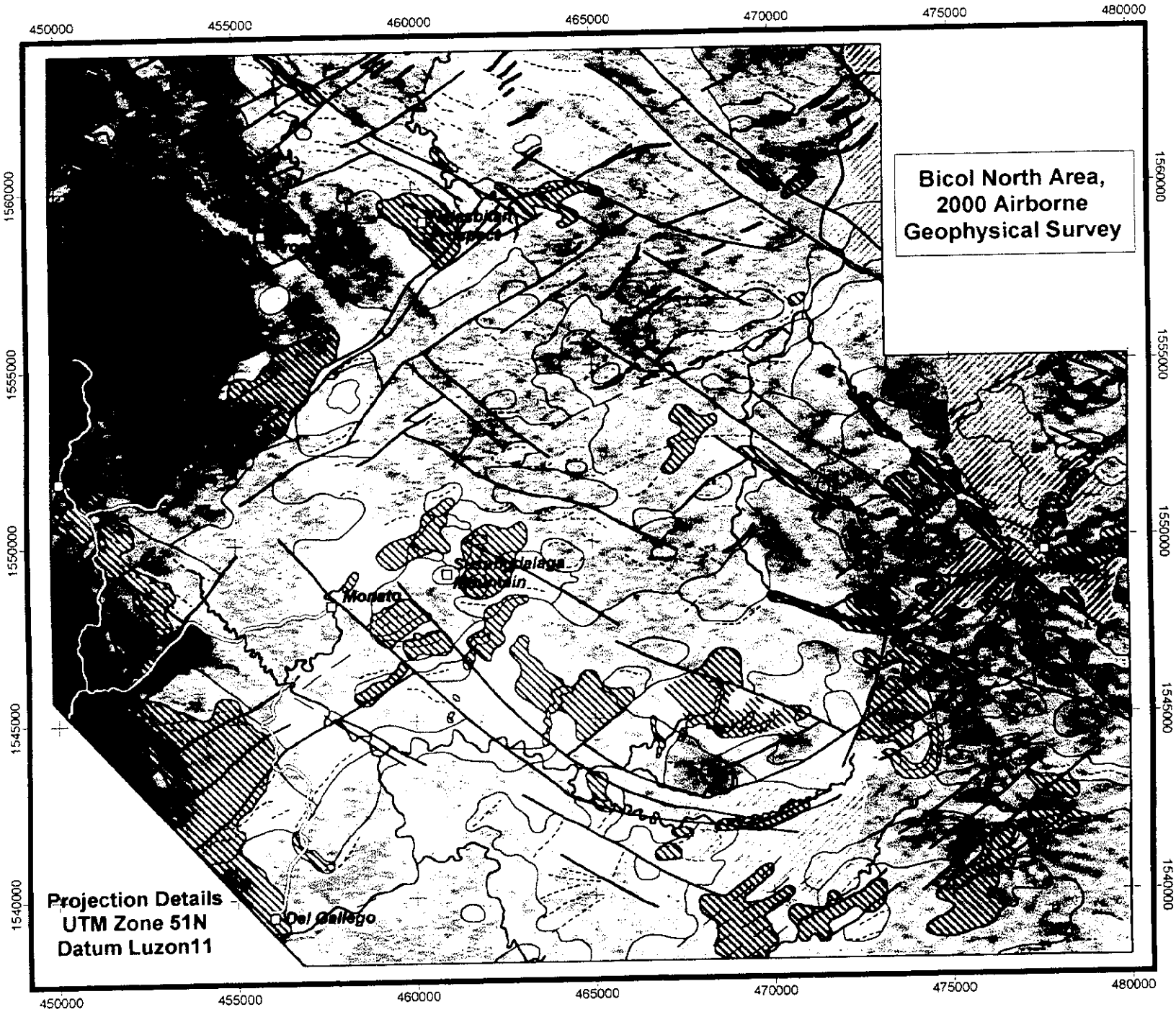


Figure 17: Interpreted magnetic model, Line 476400mE (see Fig. 14 for key to model colours)



Legend

- Localities
- Roads
- Major Drainage
- Geological - Geophysical Contact
- Fault
- Dyke
- Topographic Linear
- Magnetic Trend
- Survey Boundary

Mount Labo Pyroclastic Flows

QLpf1

QLpf2

Alteration Zones

- Mapped Alteration
- Broad High K Zones
- Structure Controlled K
- Halo K Alteration
- Magnetite Depletion

Scale 1 : 150 000

1 0 1 2 3 4 5

Kilometers

Figure 18
Ternary Gamma-ray Spectra Image with Superimposed Geophysical Interpretation and Alteration Map

FUGRO

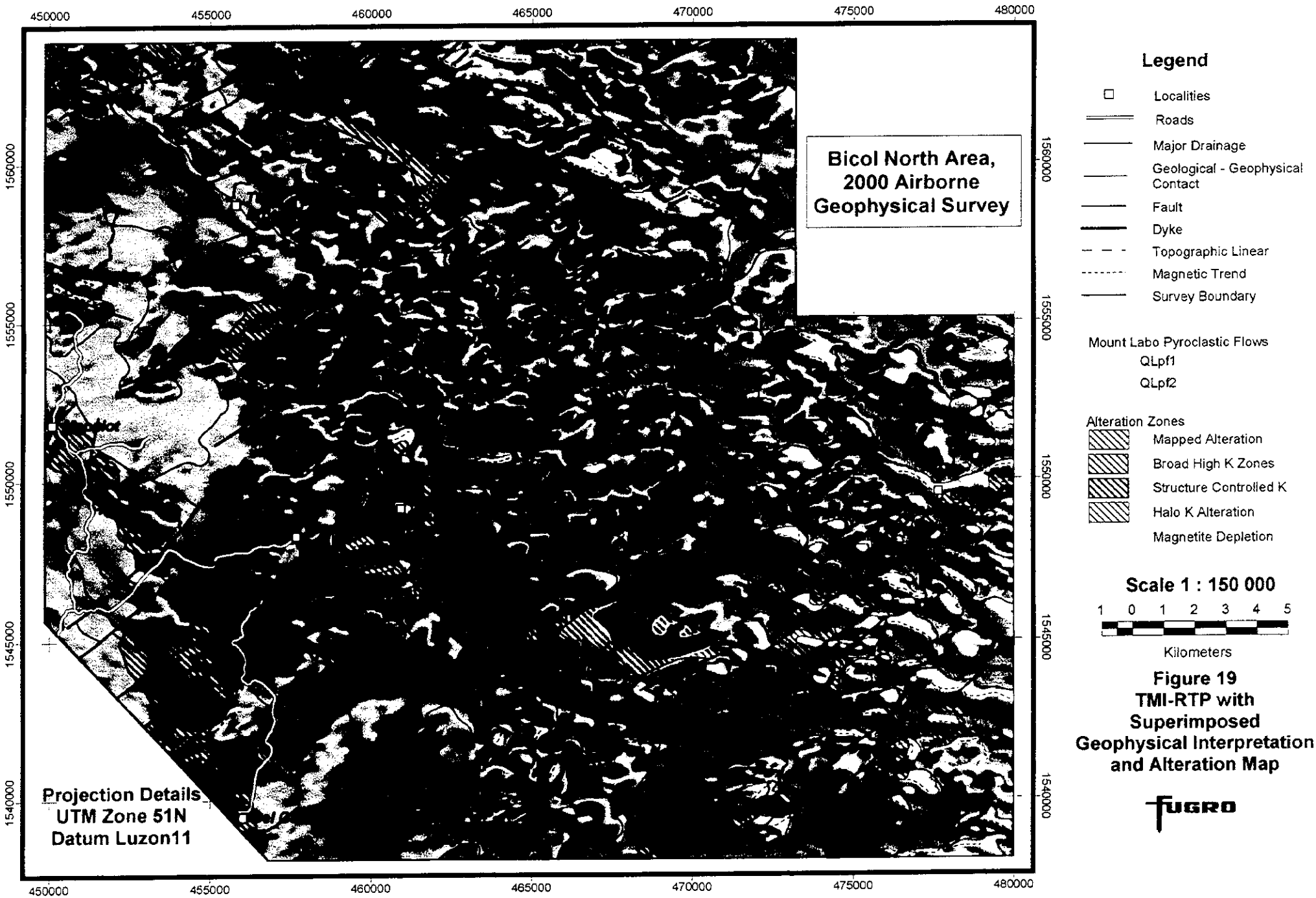
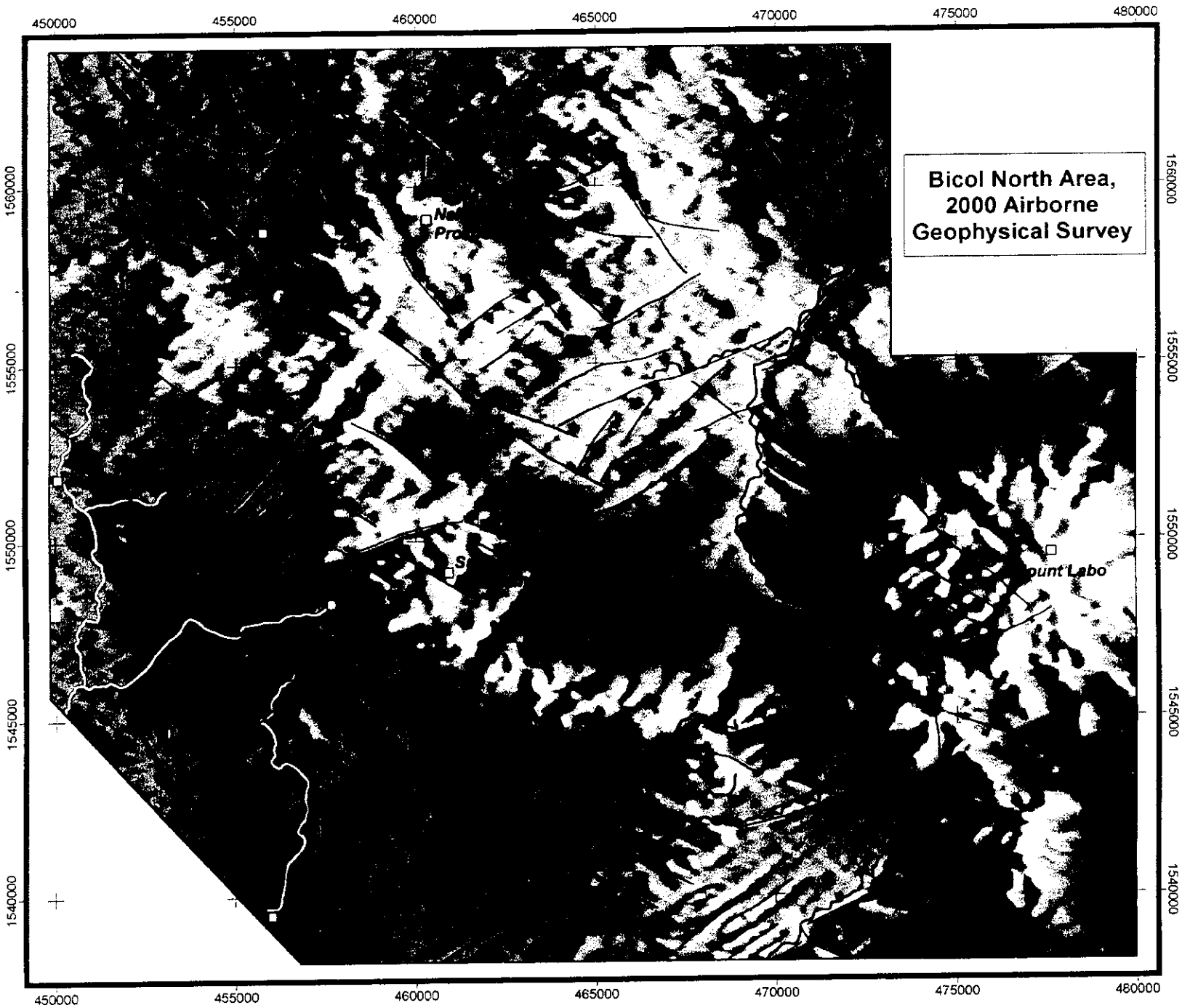


Figure 19
TMI-RTP with Superimposed Geophysical Interpretation and Alteration Map

FUGRO



Legend

- Localities
- Roads
- Major Drainage

Projection Details
UTM Zone 51N
Datum Luzon11

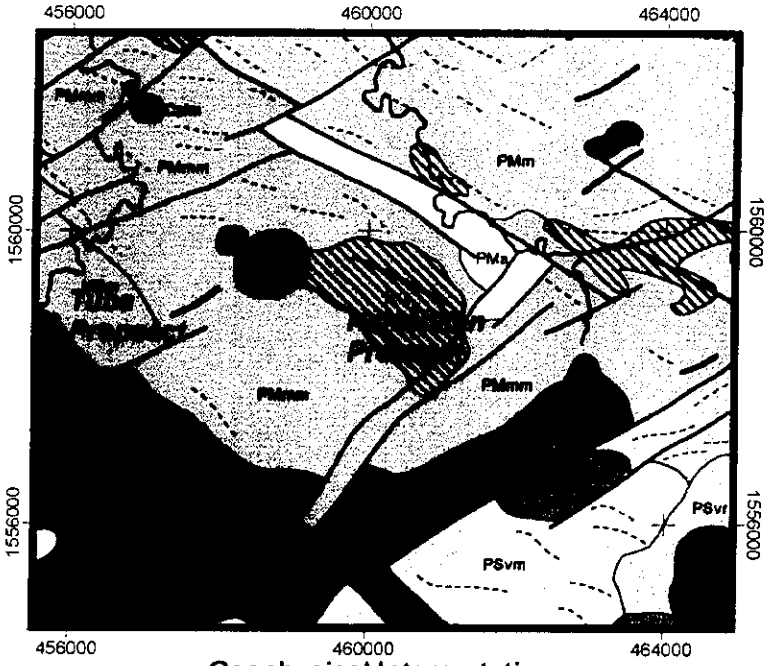
Scale 1 : 150 000

1 0 1 2 3 4 5

Kilometers

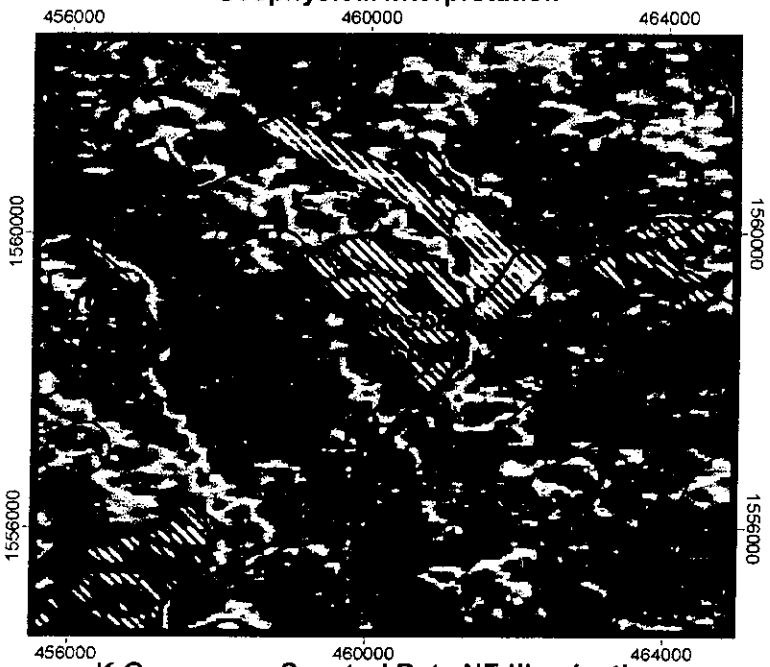
Figure 20
Digital Terrain Model
E Illumination with
Prominent Topographic
Linears

FUGRO



Geophysical Interpretation

TMI-RTP NE Illumination



K Gamma-ray Spectral Data NE Illumination

DEM E Illumination

Legend

- Localities
- Roads
- Major Drainage
- Geological - Geophysical Contacts
- Fault
- Dyke
- Topographic Linear
- Magnetic Trend
- Survey Boundary
- Topographic Linears in DEM

Geological - Geophysical Units

Cainozoic Intrusives
- CzIm
- CzIr
- CzIr-k
- CzIp
- CzIg

Labo Pyroclastic Flows
- QLpf1
- QLpf2

Labo Volcanics
- QLcc
- QLdd
- QLbum
- QLbun

Susung Dalaga Volcanics
- PSvc
- PSvm
- PSvn
- PSvr
- PSvh
- PSva

Macogon Fm.
- PMm
- PMmm
- PMa

Bosigon Fm.
- MBm
- MBn

Tigbinan Fm.
- KTm
- KTmk
- KTn
- KTnk

For alteration overlay legend see Figure 22

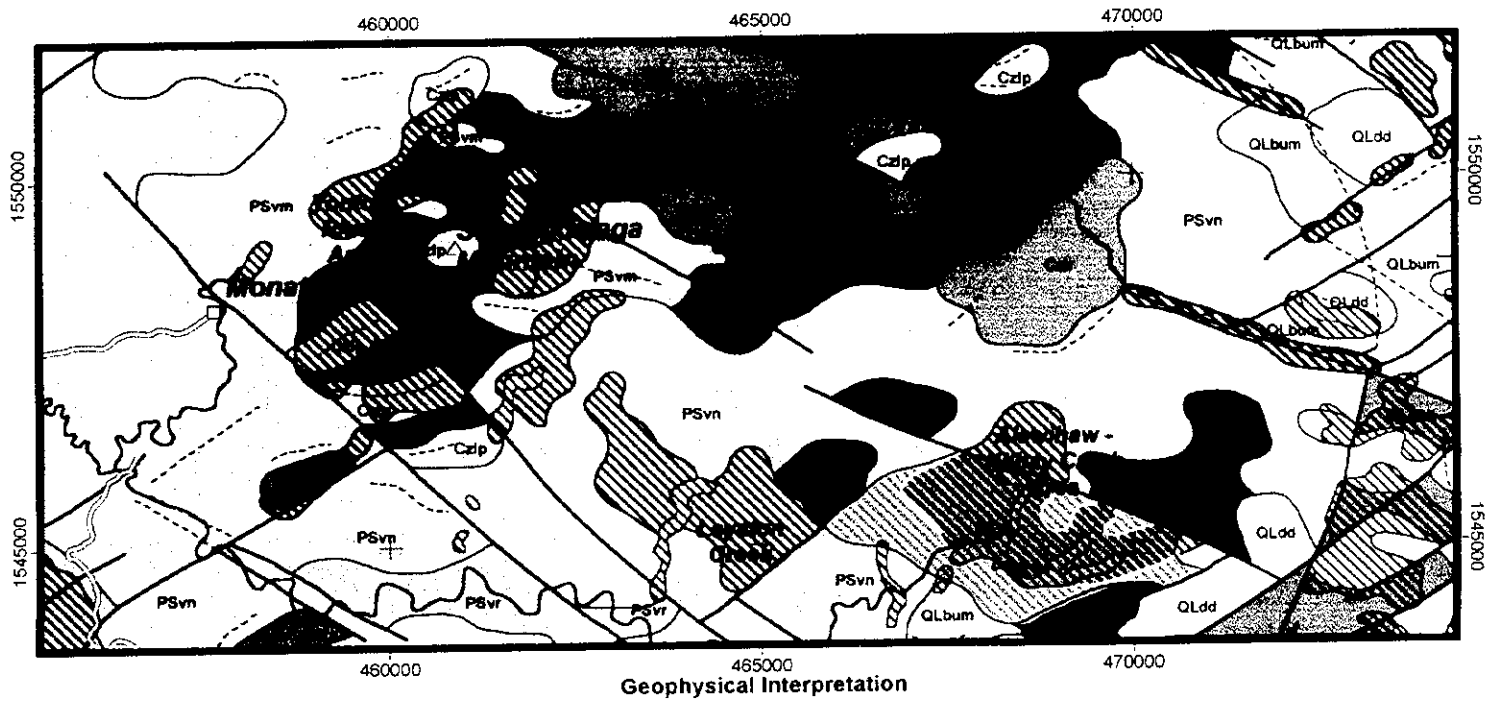
1 : 100 000

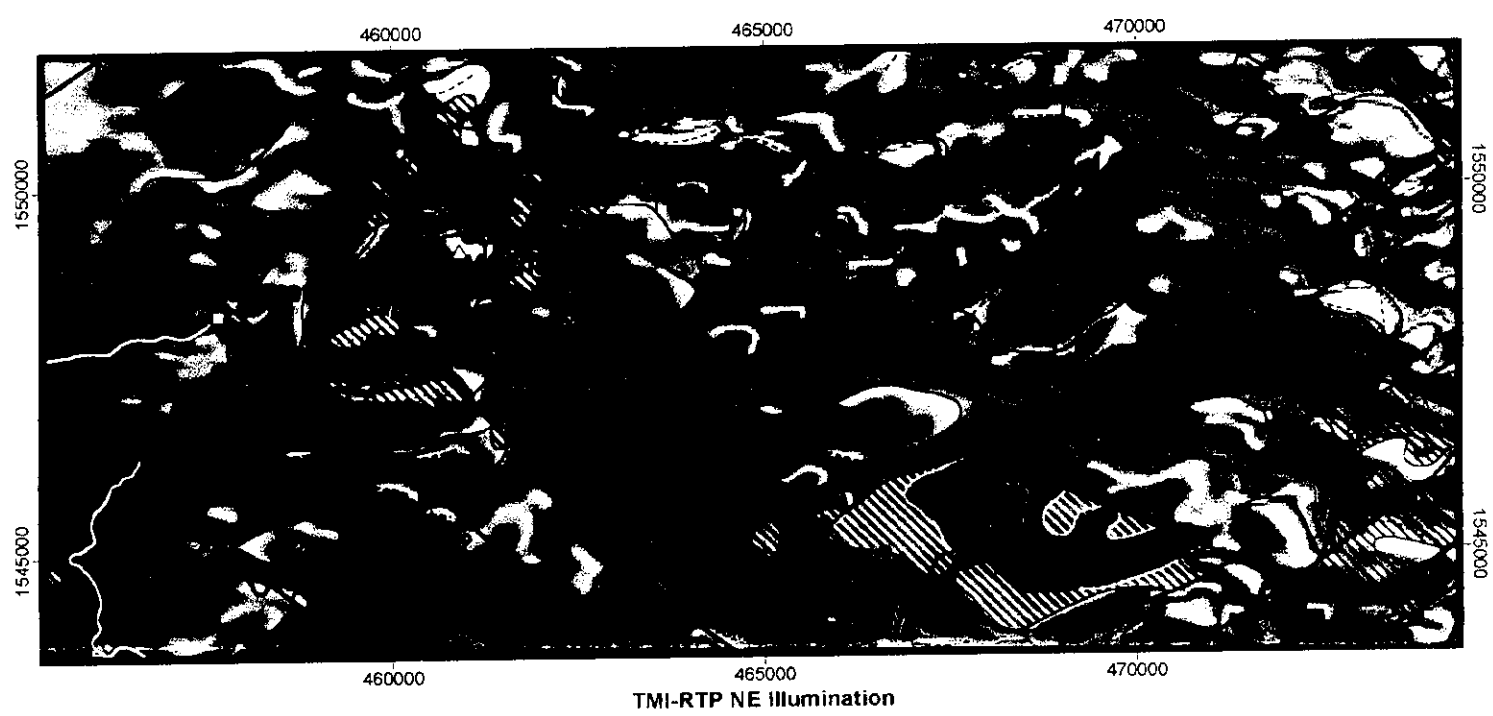
1 0 1 2

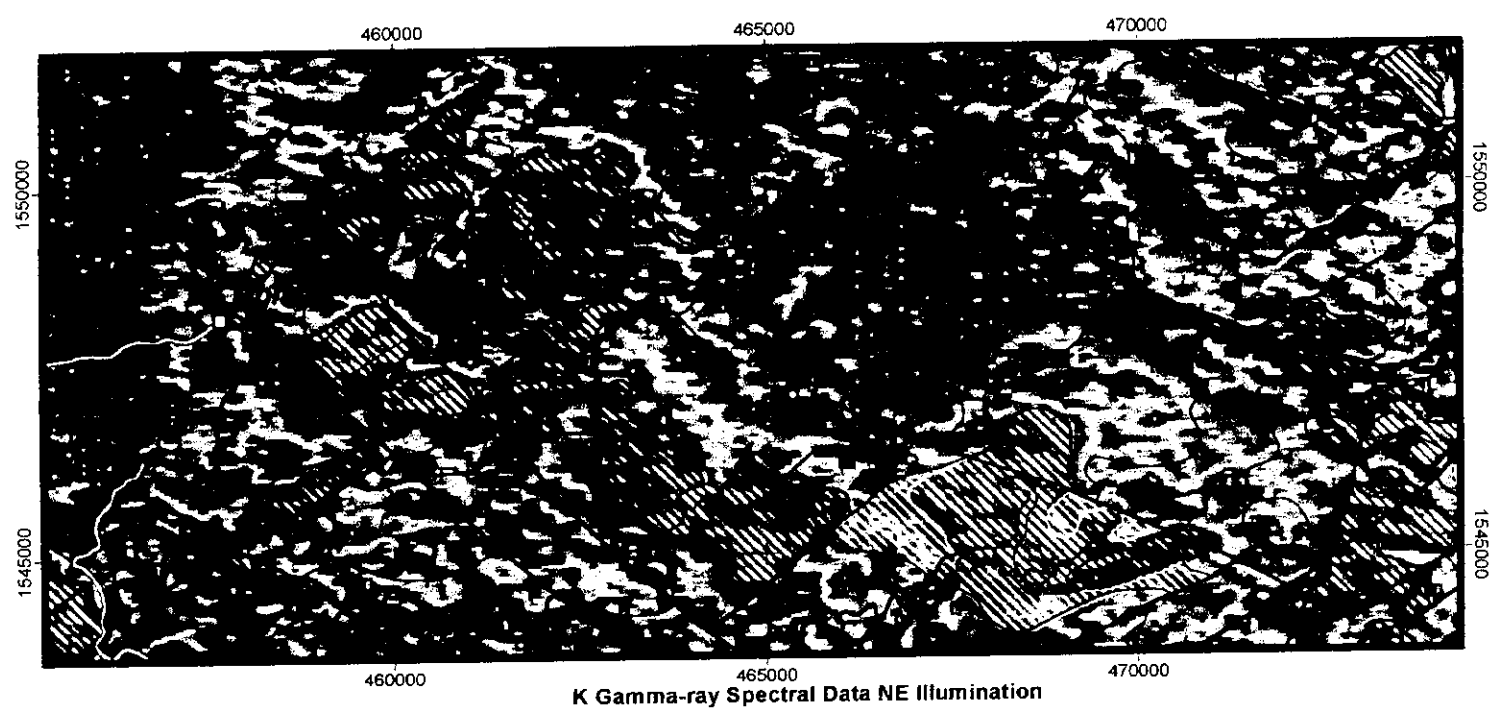
Kilometres

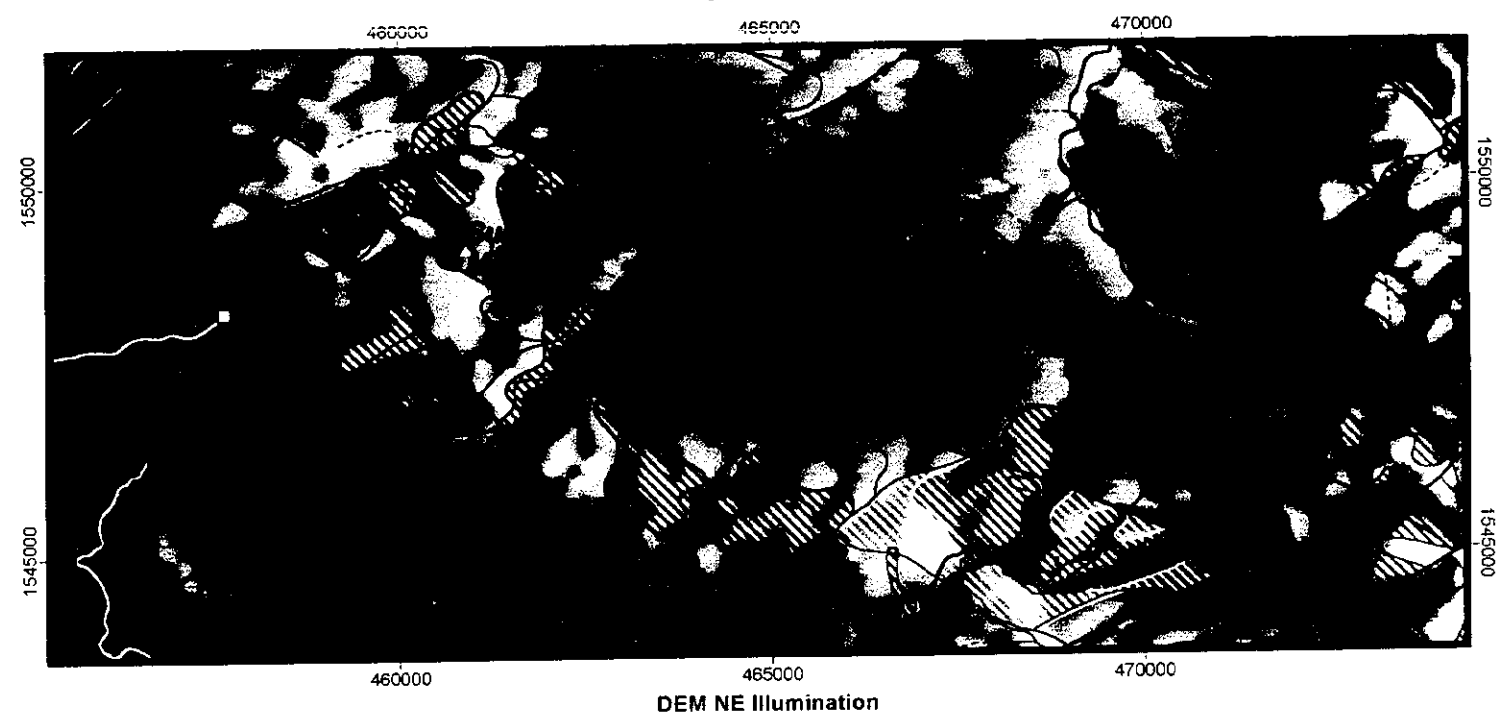
Figure 21
Geophysical Character of the Nalesbitan Prospect Area

FUGRO









Legend

- Localities
- Roads
- Major Drainage
- Geological - Geophysical Contacts
- Fault
- Dyke
- Topographic Linear
- Magnetic Trend
- Survey Boundary
- Topographic Linears in DEM

Geological - Geophysical Units

Cainozoic Intrusives
- Czim
- Czlr
- Czlr-k
- Czlp
- Czlg

Labo Pyroclastic Flows
- QLpf1
- QLpf2

Labo Volcanics
- QLcc
- QLdd
- QLbum
- QLbun

Susung Dalaga Volcanics
- PSvc
- PSvm
- PSvn
- PSvr
- PSvh
- PSva

Macogon Fm.
- PMm
- PMmm
- PMa

Bosigon Fm.
- MBm
- MBn

Tigbinan Fm.
- KTm
- KTmk
- KTn
- KTnk

Alteration Zones

- Mapped Alteration
- Broad High K Zones
- Structure Controlled K
- Halo K Alteration
- Magnetite Depletion

1 : 100 000

2 0 2 4

Kilometres

Projection
UTM Zone 51N
Datum Luzon 11

Figure 22
Geophysical Character of the Alawihaw - Kilbay Creek Area to Susungdalaga Mountain

FUGRO

1 Magnetic Modelling

1.1 Introduction

Magnetic modelling was completed over four profiles (Fig. 13). The profiles correspond with surveyed flight lines and were selected in order to give coverage over the main geologic regions and units within the study area, as well as covering the Nalesbitan Prospect. Due to the dominant northeast and northwest structural trends within the area, modelling on north-south profiles was considered most appropriate.

The resultant models generated (Figs 14-17) all show calculated and observed total magnetic intensity in the upper pane, and the modelled magnetic bodies with topographic profile in the lower pane. There is no vertical exaggeration for the modelled profiles. All models were generated using Model Vision Pro software (Version 3.10.16) using the corrected total magnetic intensity data. Modelled bodies are colour coded according to interpreted magnetic susceptibility values (Fig. 14). Only magnetic units are depicted in the modelled profiles. Each model uses the same IGRF values of field strength of 40535 nT, inclination of 13.8° and declination of –1.1°.

Several general parameters and features of magnetic modelling are significant in the interpretation of data for the Mount Labo area. Strongly magnetic strata which are exposed or present at shallow depths, have a much greater effect of the magnetic response than if the same strata are present at moderate depths. Thus the recognition of near surface, highly magnetic units in rugged topographic terrain is important in accounting for magnetic anomalies of high amplitude and low wavelength which dominate this dataset.

In volcanic dominated terrains such as the Mount Labo area, the presence of remanent magnetisation also has an impact of the observed magnetic response. Remanence may result from magmatic rocks cooling and crystallising in a magnetic field in a differed orientation from the earth痴 current magnetic field. If strong remanent magnetisation exists in a body, the total magnetisation is computed as the vector sum of the remanent and induced magnetisation components. Since specific information on remanent magnetisation of rocks from the Mount Labo area is not available, pure induction has been assumed and dominant remanent magnetisation has been modelled as negative susceptibilities. Remanent magnetisation in various volcanic units in the Mount Labo area is interpreted in

both the geophysical interpretation discussed above and in the magnetic modelling described below.

1.2 Line 460 000 mE

This profile covers the Nalesbitan mineralisation, the volcanic sequence of the Macogon Formation, and the Susung Dalaga Volcanics at the south end. Modelling confirms these units as comprising sets of exposed or near-surface shallowly dipping magnetic sheets (presumably lavas) which produce the high-frequency anomalies in the magnetic data. The magnetic sheets are predominantly normally polarised in the north (Unit PMmm), reversely or negatively polarised in the south (Units PMmm and PSvh/PSvm), and rarely extend to depths beyond 300m. At greater depth the volcanic units can no longer be distinguished as individual units. The modelled volcanic sheets have generally not been shown individually within the interpretation map (Enclosure 1), but are more commonly represented as trend lines. Modelling across Nalesbitan suggests that the volcanics are gently folded. The most striking features along the profile are the three intense magnetic lows at 1555220 mN, 1557010 mN and 1560480 mN. All have been modelled as sub-vertical fault zones of moderate magnetic intensity (7500-9000 SI units). The main northern fault zone is 900 m wide and is modelled as a moderately magnetic zone on the southern side and a non-magnetic zone on the northern side. It trends 120° parallel to a set of smaller structures through Nalesbitan. The model also identifies NE-trending dykes intruding the Macogon Formation.

1.3 Line 460 800 mE

This profile represents an extension of 460000 mE, offset to the east by 800 m (Fig.13). Modelling suggests a series of shallow northerly-dipping units in the north and shallow southerly dipping units on the southern end of the modelled profile. The dips are similar or slightly steeper than those of units on Mount Labo, and are generally less than 25°. These may represent the primary dips of lava flows on the flanks of a now eroded strato-volcano with an eruptive centre just north of Susungdalaga Mountain. Interpreted intrusives modelled south of Susungdalaga Mountain (Unit Czlp) appear to be both dome- and sheet-like in form. A possible dome is also modelled at the inferred volcanic centre corresponding to a mapped "intrusive", and corresponds to Susungdalaga Mountain itself.

Volcanic sheets north of the interpreted volcanic centre have been interpreted to a depth of 300 m which puts the base of the volcanic pile near Mean Sea Level. By contrast the

sheets south of the volcanic centre extend to below MSL reflecting a former topographic low to the south (?marine environment).

As for profile 460000 mE, exposed and near-surface modelled bodies largely account for the observed magnetic response.

1.4 Line 468 400 mE

As for the other profiles, modelling for line 468400 mE has indicated a series of shallow dipping (less than 30°) volcanic sheets which give rise to numerous short wavelength magnetic anomalies. The northern end of this line suggests a shallow S-dipping structural contact (?thrust) between the N-dipping Macogan Formation and older underlying units of the Bosigan Formation, with units of the latter dipping south beneath the interpreted volcanic sheets of the Macogon Formation. As on line 460000 mE, major faults are represented by intense magnetic lows (1551630 mN, 1557130 mN and 1558940 mN). The latter is strongly magnetic (~13000 SI units), 200 m wide and trends 115° parallel to the narrower body at 1557130 mN which represents a continuation of the major fault zone at 1560480 mN on line 460000 mE. The structure at 1551630 mN trends 055° and may be a mafic dyke rather than a magnetically altered fault zone.

Other more dyke-like bodies have been identified at 1554440 mN and 1558180 mN and are reversely polarised.. As for the above two profiles, most of the magnetic response is derived from units of limited depth extent. Both normal and reversely polarised volcanic units are present, with the latter being older and closer to the volcanic centre. An inferred reversely polarised intrusive body located near 1556500 mN, has been modelled as two shallow bodies, possibly separated by an 055° trending fault. Geometry is complicated by the fault present on the north side.

A volcanic centre is interpreted at ~1549600 mN and is characterised by a magnetic low with reversely polarised sheets dipping away from this centre on either side. This centre corresponds to a subtle topographic 田rater" or depression in the DEM (Fig. 3).

1.5 Line 476 400 mE

This profile is located just west of the summit of Mount Labo and models a number of thin volcanic sheets dipping largely parallel to the present topographic surface. Most are normally magnetised consistent with the current state of the earth痴 magnetic field. More equi-dimensional bodies on the south flank of Mount Labo (e.g. 1545500 mN) correspond to

some of the lava domes. However, they appear to have little depth extent, and correspond to ridges and topographic highs suggesting that alternatively they may represent the dissected remnants of former flows now isolated by erosion along drainages. At the northern end of the profile, a deeper modelled tabular sheet represents an older volcanic unit which contributes to the overall magnetic response in this area, but again the higher frequency magnetic anomalies are due to near or at surface features of limited depth extent.

Results of K-Ar Age Determination

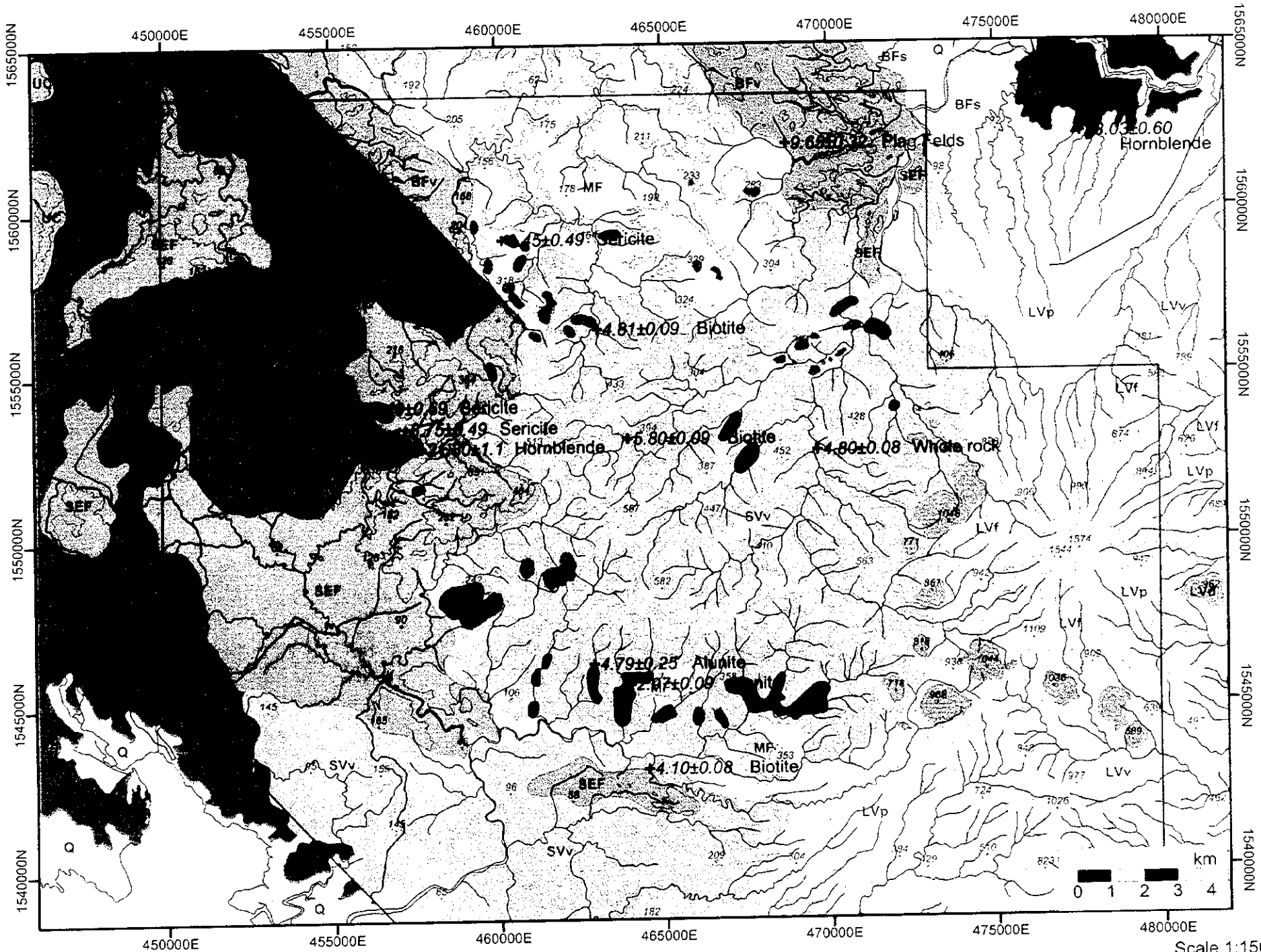
No.	Sample No.	Coordination		Rock Type	Location	Minerals	Potassium (K wt%)	Rad. ^{40}Ar (10^{-6}cc/g)	K-Ar Age (Ma)	Air Cont. (%)	Average of K-Ar Age (Ma)
		E-UTM	N-UTM								
1	BC18	460177	1559124	wt sericite-quartz argillic rocks with limonite network	Nalesbitan depposit	Sericite					8.45±0.49
2	BE05	463033	1556343	gy c grained bt bearing dac	Southeast of Nalesbitan	Biotite					4.81±0.09
3	KJ02	455995	1554088	wt sericite-quartz argillic rock	Katakian alteration zone	Sericite					9.10±0.69
4	KJ08	457186	1553020	wt sericite -quartz clay	Katakian alteration zone	Sericite					8.75±0.49
5	KK07	464478	1543059	fresh bt dac	South of Kilbay River	Biotite					4.10±0.08
6	KL13	463943	1545615	stg silicified rock with alunite-pyrite	Layaton Malaki alteration zone	Alunite					2.97±0.09
7	KM04	462855	1546255	altered dacite rich in alunite	Maniknik alteration zone	Alunite					4.79±0.25
8	KN01	457696	1552845	gy fresh hb, pl porp dacite	Near Katakian alteration zone	Hornblende					21.30±1.1
9	LA01	468757	1561953	dk gn msv hb bearing basalt	Lower Labo River	Plag Felds					9.65±0.32
10	LA02	469659	1552697	gy pl porp(2-3cm) glsy and ~dac	Upper Labo River	Whole rock					4.80±0.08
11	LE03	463922	1553083	gy fresh bt-hb pl porp dacite	West of Taktak alteration zone	Biotite					5.80±0.09
12	LP06	477589	1562215	gy f-grained granodiorite	Near Manit Occurrence	Hornblende					13.03±0.60

Dating was done by Research School of Earth Sciences, Australian National University.
Decay Constant (after Steiger and Jaeger,1977):

$\lambda e = 0.581 \times 10^{-10}$ /yr

$\lambda \beta = 4.962 \times 10^{-10}$ /yr

^{40}Ar coontent in K : $^{40}K/K = 0.01167$ atom %



Scale 1:150,000

K-Ar Age Determination and Analyzed Mineral