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Diamond drilling program on target area no. 11 and sample drilling in Karasjok area

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Rapporten inneholder også en rapport ang. "Target area II - Finnmark, Sept. 19/80. Magnetics and self potential survey" av Steve Medd.

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KONFIDENSIELL
Report no 1147

DIAMOND DRILLING PROGRAM ON TARGET AREA NO. 11 AND SAMPLE DRILLING IN KARASJOK AREA. A/S Sydvaranger

GEOLOGY.

In 1979 an ultramafic body was found in the Addjatavzi area 20 km NNE of Karasjok. The body has a NS and NV-SE strike with a maximum size of 1,8 x 0,4 km. It dips 40 to 60° to the east. Due to a rather high magnetitecontent in parts of the ultramafic body the boundary of the ultramafic body is partly determined from magnetic ground measurements. Geological mapping in the area is rather difficult because of heavy overburden. The ultramafics, however, are resistant against weathering so the central part of it is rather well exposed.

The outlines of the ultramafic body can be seen on the enclosed SP-map.

The ultramafic consists of 89-90 % serpentine in 0,5-2 mm grains, 10-20 % of Mg - Chlorite (Penninite) and a little carbonate. A whole rock analyses of a sample from the ultramafic body shows the following composition :

SiO_2	37,4 %	MnO	0,18 %	K_2O	not detected
TiO_2	0,35%	MgO	30,92 %	P_2O_5	0,04 %
Al_2O_3	5,15%	CaO	2,52 %	CO_2	2,34 %
Fe_2O_3 tot.	11,4 %	Na_2O	0,04 %	Ign.loss	10,43 %

Ore minerals : Pentlandite and chalcopyrite are found in samples from the ultramafic body, but only as traces. Large bolders with pyrrhotite banded with amphiboles are found. Analyses from these shows no Nickel and Copper contents.

Amphibolite sometimes with garnets and bands of felsic gneiss surrounds the ultramafic body.

Chlorite rock (greenstone ?) is found both in the amphibolite and in the ultramafic body.

Two small areas with gabbro are found.

Traces of malachite is found in the southern part of the ultramafic body.

In the very SE part of the area by the sharp bend of the creek it is found a very bleached rock which is believed to be an altered gneiss. Bleached rocks similar to the type being found often are seen near

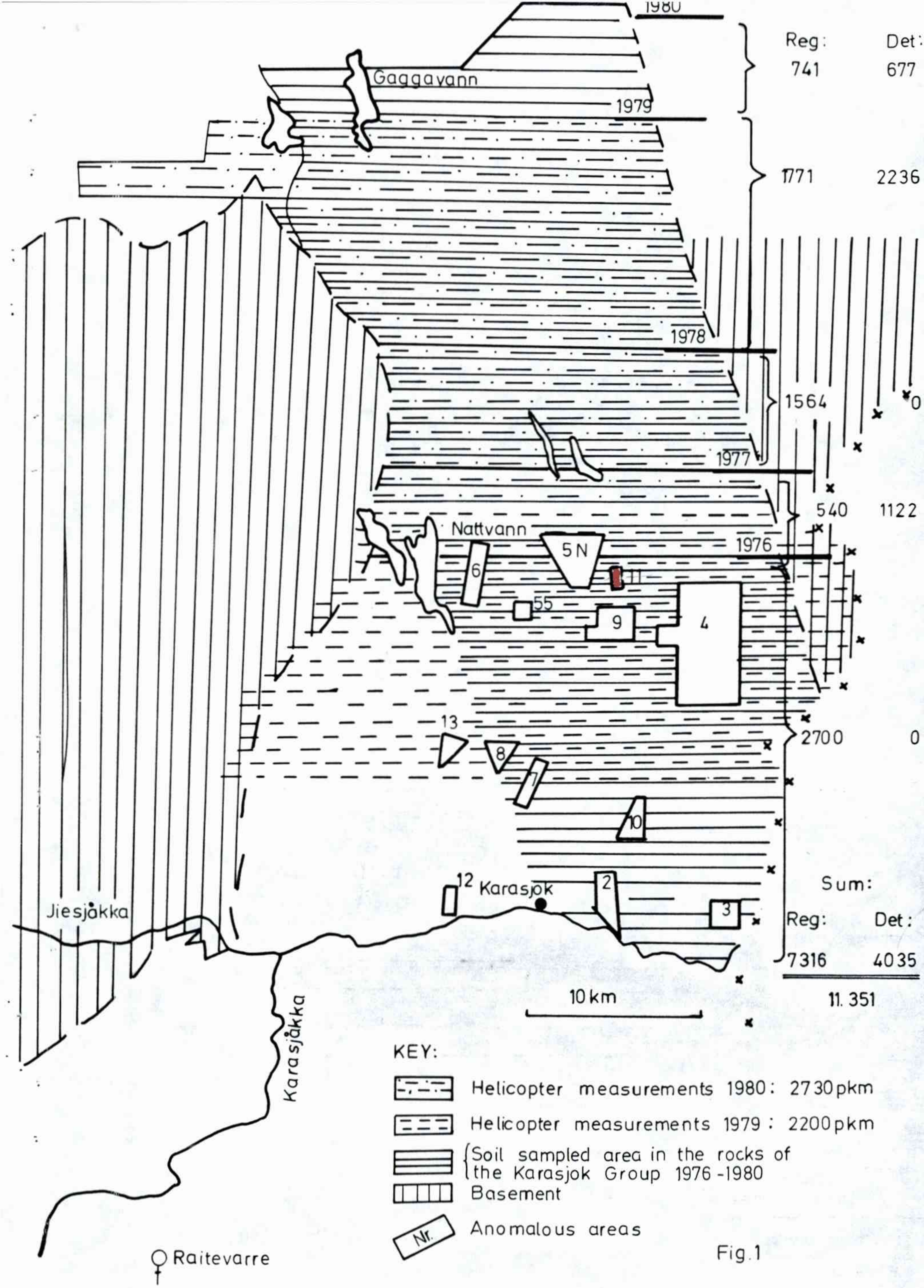

1980
Reg:
Det:
741
677
Gaggavann
1979
1771
2236
1978
1564
0
1977
540
1122
Nattvann
5N
1976
6
11
55
9
4
13
2700
0
8
7
10
12
Karasjok
2
Sum:
Jiesjåkka
3
Reg:
Det:
7316
4035
11. 351
10 km
Karasjåkka
KEY:
Helicopter measurements 1980: 2730 pkm
Helicopter measurements 1979: 2200 pkm
Soil sampled area in the rocks of the Karasjok Group 1976-1980
Basement
Nr.
Anomalous areas
Raitevarre

Fig.1

massive sulphide deposits.

GEOCHEMISTRY.

Two enclosed transparent maps show the highest Cu-Ni and Zn-Pb soil anomalies from the area. Soil samples were first taken in 1979 with sample distance 50 m and a spacing of 250 m between the lines. This summer additional soil samples were taken with sample distance 25 and 12,5 m over the Sp-anomalies from the first recognitional ground measurements. Especially the southern part of the ultramafic body gives a rather high Ni and Cu anomaly in the soils with contents of 400 ppm Ni and 400 ppm Cu as the highest.

Very few Zn and Pb anomalies showed up which also were suspected. It was however a combined Zn-Pb anomaly in the SE part of the area over the highest Sp-anomaly. A Pb and Cu-anomaly shows up in the very SE-part of the area by the sharp bend of the creek over the outcrops of the bleached gneissic rocks. One Zn-Pb anomaly can also be seen in the southern part of the ultramafic body.

Concerning the lead anomalies, it should be mentioned that lead is a rather common accessory element in Cu-Ni-ores derived from ultramafic magmas.

The lead-telluride altaite is found as an accessoric mineral in the Gallujaure prospect 8 kms to the west. It also should be mentioned that lead is a very mobile element in ore forming magmas and it often forms coronas around massive sulphide deposits.

GEOPHYSICS.

Recognitional ground geophysics was carried out early in the 1980-season. It was measured SP, Mag., VLF and resistivity. Later the same season a base line was staked and the area was covered by SP and mag. measurements. The results from these measurements can be seen on the enclosed SP and mag. map.

The highest measured magnetic values are + 40 000 γ and - 18 000 γ and the SP values lies between + 152 mV and - 879 mV.

Looking upon the magnetic anomalies it is quite clear that they are caused by the content of magnetic minerals in the ultramafic body. This is very clear over the main N-S-striking body, but can also be seen over the scattered ultramafic outcrops to the NW. It is believed to be some magnetite in the pyrrhotite bolders found in the area. Magnetite also is found concentrated in the ultramafic body in certain zones.

The results from the SP-measurements reveal 4 anomalies. In the SW part of the area . the SP-anomaly is coinciding with the mag. anomaly. To the east of the ultramafic body is the largest SP-anomaly. A small magnetic anomaly (1000 γ) is also coinciding with this. To the NW it is a long SP-anomaly parallell to the mag.-anomaly with a spacing to the west of 100-150 m. This anomaly seems to continue to the NW, and possibly a little to the SE. Next summer additional measurements will be carried out both on this anomaly and also on the anomaly to the NE. To the east, rather high positive SP-anomalies envelops the area. This should confirm that the conducting zones are dipping to the east.

The VLF and resistivity recognitional measurements also came up with good coinciding anomalies with the SP-anomalies. Especially over the ultramafic body in the southern part of the area W of the proposed drillhole no. 1 resistivities of only 1-50 ohmm were measured over 170 m.

CONCLUSION AND PROPOSALS.

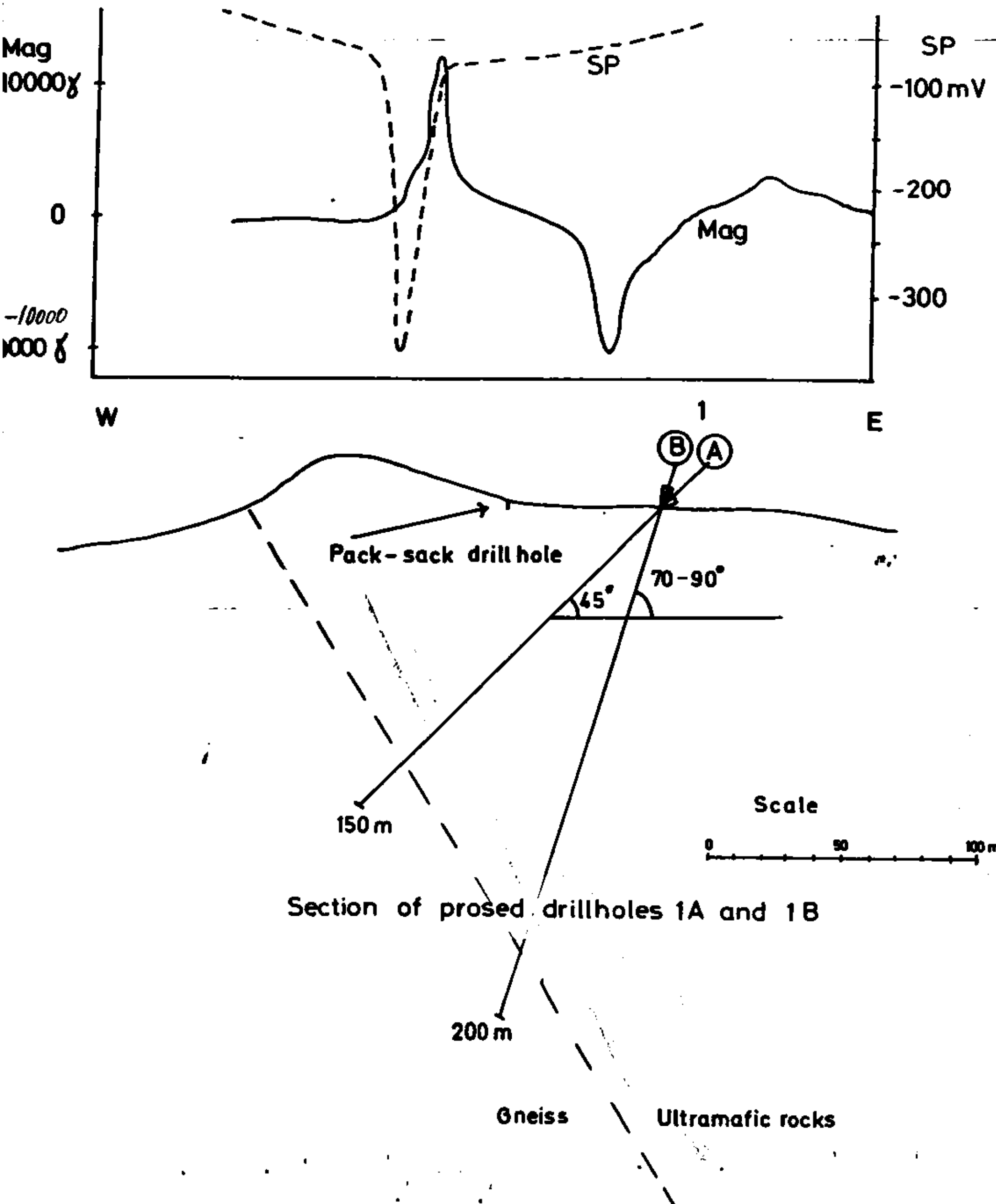
It should be stated that all electric conductors in the ground inside and in the vicinity of ultramafic bodies ought somehow to be checked. The best way would be diamond core drilling, but percurssion drilling through the overburden directly on the anomalies also is possible.

The fact that we have found large bolders with pyrrhotite and veinlets of magmatic pyrrhotite in the outcropping serpentinites over the EM-anomalies is encouraging and should lead to diamond drilling.

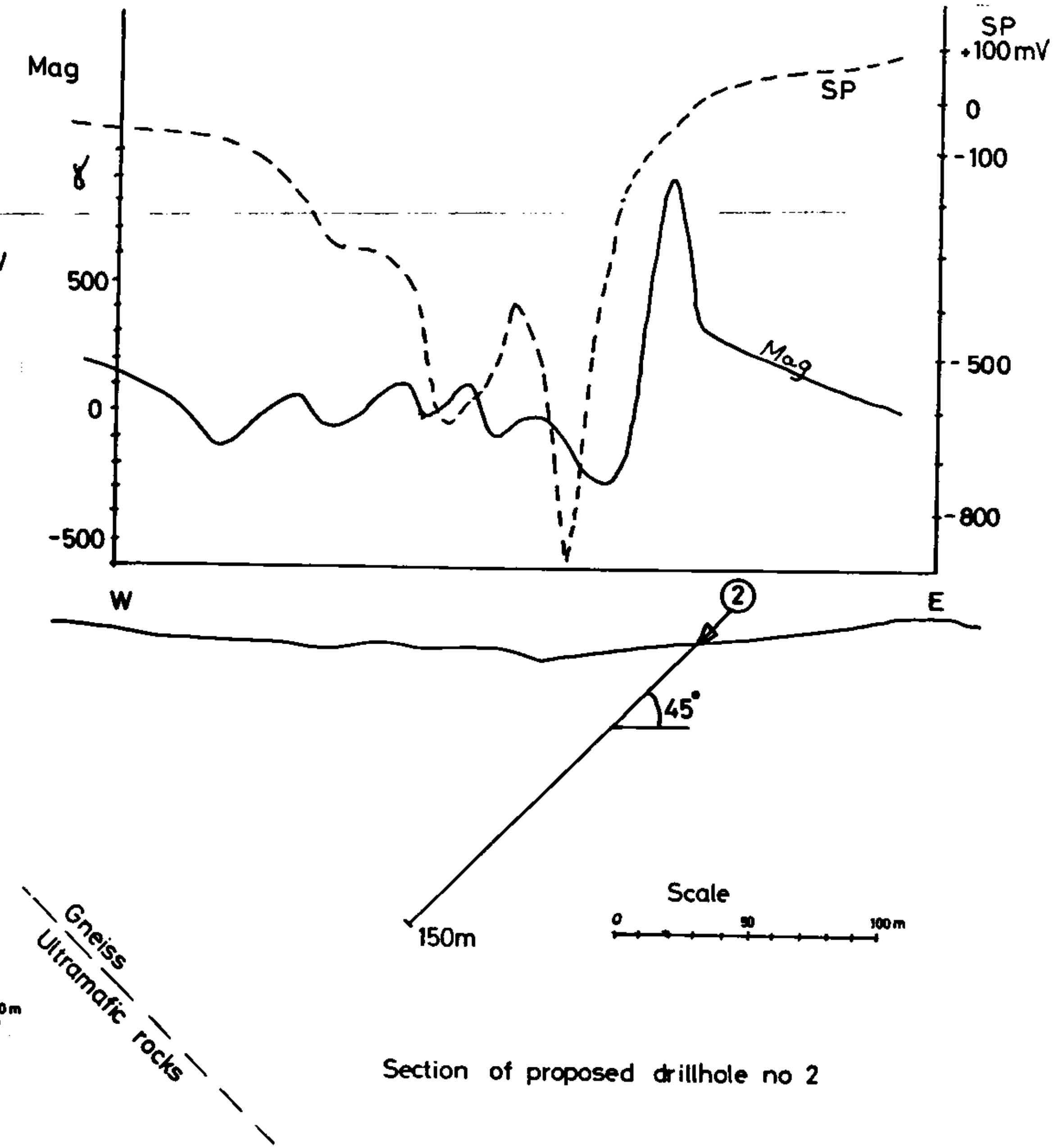
In the famous and most important Soviet Cu-Ni-deposits in the Petsamo area 200 km's to the east barren pyrrhotite is described closely related to the economic deposits.

From "Ore deposits of the USSR Vol II" edited by V.I. Smirnov, 1977 (Pitman Publishing) the following should be referred from the Kaula deposit in the Petsamo area :

"As the tectonic zone passes into the phyllites, there is a gradual decrease in the thickness of the uniform, breccia-like, and accompanying mineralized country rocks, and also a decrease in the amount of nickel and copper to the point of complete replacement of the normal copper-nickel ores by purely pyrrhotitic types. The zone of pyrrhotite mineralization can be traced to a depth of 800 m from the surface".



Section of prosed drillholes 1A and 1B



Section of proposed drillhole no 2

DRILLHOLE NO 1 A AND 1 B.

The figure of the proposed drillhole 1 A and 1 B also shows the mag. and SP-anomalies. Resistivity measurements over the proposed area showed resistivities as low as 1-50 ohmm from the drillhole and 170 m towards the west. It is proposed two holes 1 A and 1 B here to get precise information of the dip of the mineralization and ultramafic body. The possible difference of metal content in these two sections also will give information of increase or decrease of metal content towards the depth to the east.

A pack-sack drillhole in serpentinite to a depth of 3,6 m in the anomaleous area near the proposed drillhole one had two sections of 1-2 cm's of magmatic pyrrhotite and some traces of chalcopyrite.

DRILLHOLE NO 2.

This hole should also be drilled because of the very high SP-anomalies, see figure. The SP-anomalies are so high that they possibly are caused by black shists. On the other hand it is not likely to believe that it is black shists because the strike only is 450 m.

Nearly coinciding with the SP-anomaly it also is a small mag. anomaly - 250 to + 900 gammas.

Soil sample anomalies of Cu, Ni, Pb and Zn are also coinciding with the SP-anomalies.

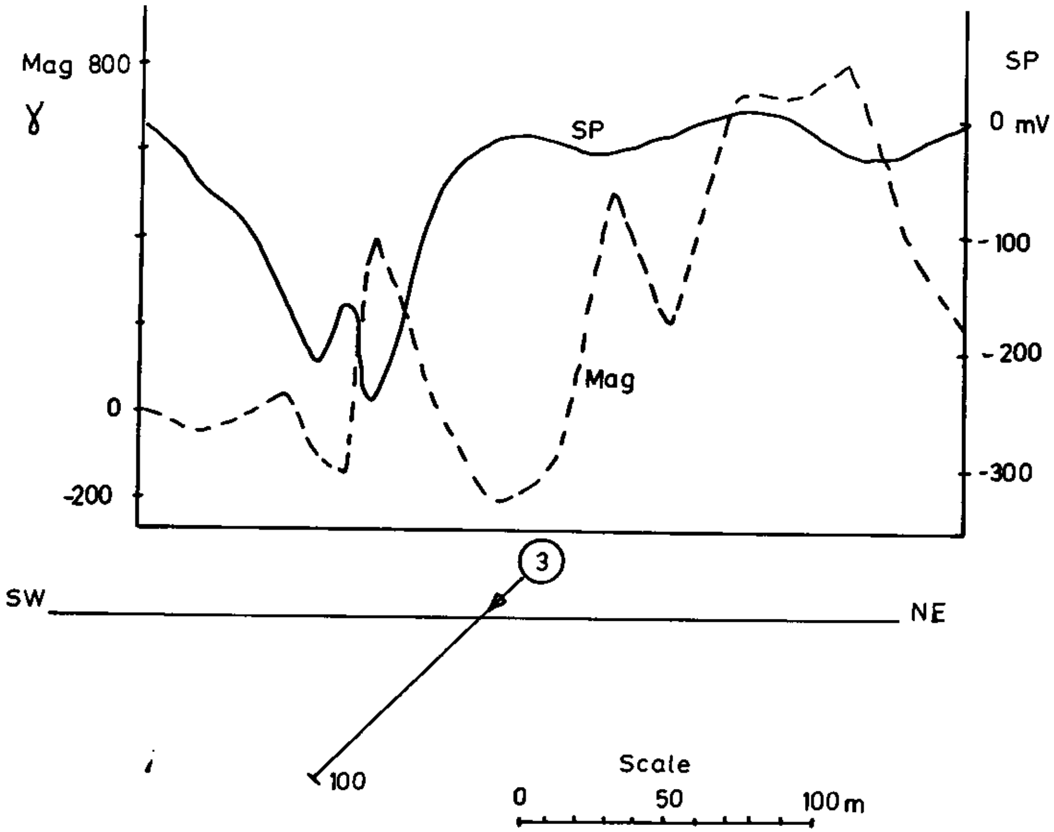
Approximately 100 m to the south of drillhole no 2 the outcrops of the mentioned bleached rocks are found.

If the ultramafic body is dipping in the order of 45° to the east it is possible to reach it by extending drillhole no 2. Another diamond drilling proposal should be set up for extending hole no 2 in case the holes from no 1 are encouraging positive.

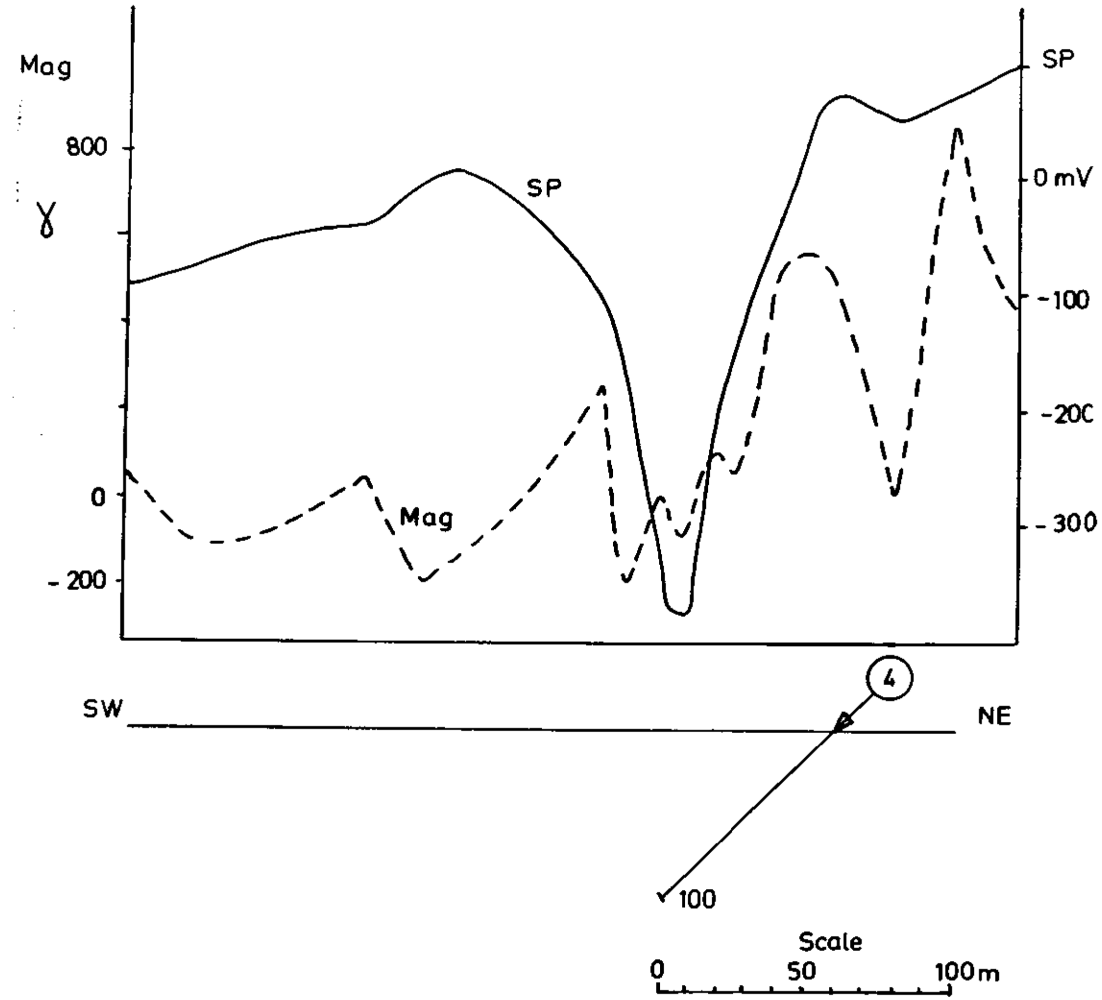
DRILLHOLD NO 3 AND 4

should not be core-drilled in case the results from the no 1 and 2-holes are very negative. Even weak positive results from hole no 1 and 2 should lead to drilling of holes no 3 and 4. No 3 and 4 will be together 200 m.

In area no 11 we are in a very important ultramafic-greenstone-belt which can be followed approximately 15 km's to the north. By having as much basic knowledge as possible from target area no 11 it will be easier to evaluate the whole belt.



Section of proposed drillhole no 3



Section of proposed drillhole no 4

Fig 3

COSTS.

As mentioned under the drilling proposals the drillholes no 3 and 4 should not be drilled if the results from holes no 1 and 2 are very negative. By this matter two different drill proposals will be set up :

1.	Drillhole no 1 A,B	350 m
	" " 2	150 "
	Diamond drill proposal no 1	500 m
2.	Proposal no 1	500 m
	Drillhole " 3 and 4	200 "
	Diamond drill proposal no 2	700 m

A separate drilling program with a sample driller on anomalies with shallow overburden should also be taken into account as for the 1980 budget with NOK 80 000.

With a total cost per core m in this remote area of NOK 800,- we will have the following costs :

Diamond drill proposal no 1.

500 m, NOK 800,- per m	NOK 400 000
Sample drilling	" 80 000
Total costs of diamond drill proposal no 1	NOK 480 000

Diamond drill proposal no 2.

700 m, NOK 800,- per m	NOK 560 000
Sample drilling	" 80 000
Total costs of diamond drill proposal no 2	NOK 640 000

Stabekk, Nov. 3rd, 1980.

Bernt Røsholt

Bernt Røsholt
Geologist

SM/bs

TARGET AREA II - FINNMARK, Sept. 19/80.
MAGNETICS AND SELF POTENTIAL SURVEY.

INTRODUCTION :

This report briefly examines some of the basic trends found in the magnetics and self-potential data for Target Area II of Finnmark.

Target Area II is situated about 20 km. north of Karasjok in a zone of ultramafic intrusives surrounded by amphibolites and gneisses. The ore minerals of interest here are iron and iron-nickel sulphides. Magnetic and self-potential surveys were carried out during the period of Aug. 21-Sept. 18, 1980. Morning and evening mag. readings were recorded at camp daily to check the earth's magnetic field for large fluctuations. None were found. The initial S.P. zero point was arbitrarily chosen as line 1000 Y-OX.

MAG. TRENDS :

The large mag. anomaly in the central grid is very similar in shape to the ultrabasic contact as estimated from outcrops. This might suggest that the ultrabasic intrusive is the source of magnetism and that much of the magnetic mineral lies close to the surface. The area of greatest mag. intensity lies between lines 400 S and 0 crossing baseline 400 W as it trends N.N.W. There are actually two parts to the anomaly here - a trough of high negative values on the east side of baseline 400 W (highest recorded value = - 18.000), and a ridge of high positive values on the west side of baseline 400 W (highest recorded value = + 24.000).

At about line 0 - 512.5 W, the ridge-trough system starts trending N.N.E. As a result, it crosses to the east side of baseline 400 W again forming an arc.

A ridge of high positive values lies between lines 100 N and 300 N (highest recorded value = + 20.000). East of the arc lies a broad plateau of high positive values (+ 500 - + 5000), which cover most of the central grid. This plateau might indicate that the magnetic anomaly is dipping to the east. The geology of the area confirms this. Outcrops show both the ultrabasic intrusive and the country rock dipping to the east.

Another mag. anomaly of considerable area trends roughly along baseline OX between lines 300 Y and 1000 Y. Outcrops in this anomaly are ultrabasic in composition like those found within the former.

S.P. TRENDS :

A large zone of high positive S.P. values (+ 50 m V) lies to the east and south-east indicating that the rocks dip in that direction. The magnetics and geology support this also.

An arc-shape S.P. anomaly of high negative values (- 100 - - 50 m V) covers roughly the same area as the arc-shape mag. anomaly. These S.P. and mag. anomalies were probably formed from the same ultrabasic magma.

Close observation of the contour maps reveal that the S.P. ridge runs 12.5 to 50 meters west of the mag. ridge. This shows up more clearly when comparing the profile diagrams.

Since the rocks are dipping to the east, the mag. anomaly must overlie the S.P. anomaly. The mag. anomaly could be caused by magnetite and the S.P. anomaly by iron or iron-nickel sulphides. The iron sulphides could have formed from an iron-rich, sulphide-silicate solution which separated in situ. This means that the sulphides began to separate from the silicates after the solution had been injected into its present place.

The sulphide liquid would have separated from the silicate liquid due to gravity. The denser sulphide liquid would have migrated to contact depressions and contact interfaces. Later it could have been squeezed into the surrounding country rock from dykes or veins.

Meanwhile, iron-magnesium silicates would be crystalizing from the silicate liquid to form magnesiumrich pyroxenes and olivines. As more of these crystals formed the magnesium and silicate would be further depleted from the magma. The residual magma would be enriched in ore oxides. Upon crystalization we would expect to find magnetite - an iron oxide.

Thus from this pattern of liquid separation and crystalization we have a sequence of iron sulphides overlain by magnesium-rich silicates, overlain by magnetite. This might describe the formation of the intrusive body in question.

At the north end of the central grid there appears to be another S.P. anomaly in coexistence with a mag. anomaly similar to the case just discussed. This may have originated the same way also. We would then expect to find the same mineral sequence as that in the case just discussed. There are two major S.P. anomalies not in close existence with mag. anomalies. One is found in the S.E. side of the central grid. The other runs along the whole S.W. side of the N.W. grid.

In the former case the S.P. values were very high, with a peak of 879 m V. This anomaly appears to lie near the intrusive-country rock contact. Perhaps it is caused by graphite which formed by contact metamorphism of the country rock.

In the latter case a very distinct linear-shape anomaly runs alongside a mag. anomaly about 150 to 200 meters N.E. of it. These two anomalies may be too far apart to be related. Perhaps this S.P. anomaly is a dyke formed when settling sulphides were squeezed into zones of weakness in the surrounding rock. It certainly has a dyke-like appearance.

CONCLUSIONS :

1) The geology, S.P. and mag. data all indicate that the bulk of the ultrabasic intrusive is dipping east to south-east in concordance with the country rock. Therefore the bulk of the intrusive could form a tilted sill or similar sheet structure.

2) Where mag. and S.P. anomalies occur close together, the mag. anomaly appears to overlie the S.P. anomaly.

3) Lines 200 S to 300 N should be extended westward and lines 100 Y to 600 Y should be extended north-eastward and then surveyed to complete the picture.

Steve Medd

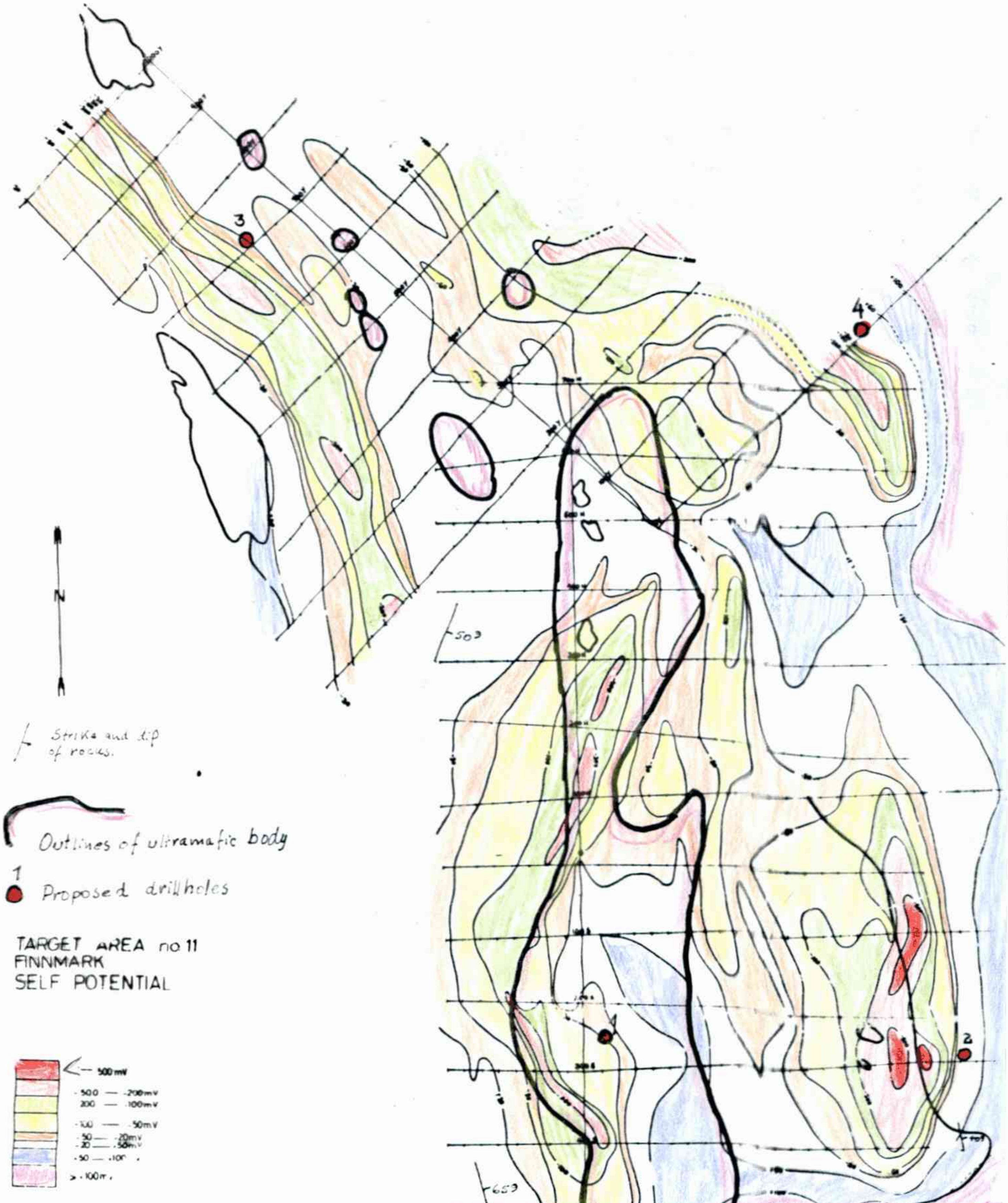

Strike and dip of rocks.
Outlines of ultramafic body
1
Proposed drillholes
TARGET AREA no 11
FINNMARK
SELF POTENTIAL
500 mV
-500 — -200mV
200 — 100mV
-100 — -50mV
-50 — -20mV
-20 — .50mV
-50 — -100
> -100m
Scale
0
100
200m
N
3
4
2

Fig 2