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Tittel

Detailed prospecting around Skrattås mine, Steinkjer.

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T H Tan	1974	Sulfidmalm A/S

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Steinkjer	Nord-Trøndelag	Trondheimske	17233	Namsos

Fagområde	Dokument type	Forekomster
Geologi geokjemi geofysikk	Rapport	Skrattås Marken Hovland shoving Bjønsås

Råstofftype	Emneord
Malm/metall	Cu Zn Pb Ag Hg

Sammendrag

BV 500

FOR FALCONBRIDGE NIKKELVERK A/S

A/S SULFIDMALM
PROJECT 905-24

DETAILED PROSPECTING AROUND SKRATAAS MINE, STEINKJER, NORTH TRØNDELAG

BY

T. H. TAN

Report No. 353-74-24.

INTRODUCTION

In the summer and autumn of 1974 a detailed field investigation was conducted in an area of about 2880 by 1100 meters around the zinc and lead mine of Skratås. The techniques here were detailed geological and structural mapping, and introductory bedrock mercury survey, geochemical soil survey and VLF survey. The purpose of this work was to gather information in order to make some evaluation on the potentails of the Skratås mine and its immediate surroundings. The field operations were started in may/june and did not quite end before the end of November.

This work is the continuation of the field exploration conducted by R. Hovland with diamond drilling operations at three sites around the mine (Ref. report no. 266-73-24 and 345-74-24).

Not all the essay results were received at the time of writing and a recheck was requested on the essay reports on several samples from the Skratås mine and other prospects. No definite conclusions are therefore presented in this report. The field investigations did, however, indicate the possibility of a complex folding, even backfolding, at the Skratås deposit. Furthermore, it seems to be established that the chance of mineralization is greater in the metasediments near the boundary with the greenstone/ greenschist zone. Geochemical soil and VLF anomalies are also found along this boundary.

GENERAL

Skratås mine lies about 10 km from Steinkjer and only one kilometer away from Sunnan railway station. The mineral rights of this mine and the nearby Bjønsås prospect is at present held by mr. Jarle Råen, Sunnan, with whom Sulfidmalm signed an option agreement in 1973. One is referred to Sulfidmalm report no. 301-74-24 for the history and background information relating to this deposit.

Apart from the eastern part of the grid area, the terrain is very rugged, with steep slopes, wooded with coniferous trees.

../2

The bottoms of the valleys are often swamps, which are sometimes inaccessible. The thick woods had offered severe difficulties during the mapping of the outcrops, and seriously retarded the measuring-out and marking of the grid lines. The more flat-lying, eastern part of the area is partly used for farming. Skratås farm lies just east of the grid area. The field called "Marken" has a different owner but is at present leased to Skratås farm. The farm "Nordheim" lies in the north-east. The tractor road between Skratås farm and the mine is used by the various owners of the forest grounds for hauling their timber down to the main road.

According to the latest geological papers, the mine lies in the so-called Lower Hovin Group of Ordovician age. No other lead-zinc deposits are known in this part of the province, but zinc-bearing pyrite-chalcopyrite deposits are known and mined in the Grong area farther north. These deposits, however, seem to occur in the stratigraphically underlying Støren Group.

The field work was started in the beginning of June with the reconstruction of the grid between 1300E and 3400E, in the following called the "original grid area". During the months of June and July magnetic and VLF survey was carried out as well as part of the geochemical soil sampling. Detailed geological mapping was started by prof. Brian Sturt and his assistant in mid-June, and this was continued by the author in July until he was ordered to Kristiansand to relog 500 meters of core from the 1973 diamond drilling around the mine.

In the autumn, the detailed geological mapping was carried out by Bjarne Lieungh and the author, who covered the areas west and east, respectively, of the mine. Following the results of the regional geochemical stream sediment survey (see report 346-74-24), the original grid area was extended westwards to 600E for additional geophysical and geochemical survey here. Only the VLF-survey, however, was completed when our activities had to be stopped in the end of November because of the darkness and snow conditions.

During the field work, we had encountered serious difficulties with respect to our grid. Several times during the field season, both in the summer and the autumn, pickets from large parts of our area were systematically removed by some unknown person or persons before the operations there were completed.

../3

Considerable time and money had to be spent to return the lines before the work here could be continued. We never found out who it could have been. We found it necessary to put up signs at several strategic places with the request to leave the pickets alone. We also placed more solid markers along the base line, that are not so easily removed or otherwise tampered with, so that at least the base line would remain intact.

Another, though perhaps easier solved, problem was the fact that not all the owners of the land, that were covered by our grid, appeared to be sympathetic to our activities on their property. Time was spent to build up a friendly relationship with those who were most skeptical towards us, by regularly informing them on our progress and on our plans for the summer, and by otherwise giving them enough reassurances that their property during this field season would remain undamaged. It should be admitted that these landowners had valid reasons for their attitude. The large vehicles which were used in connection with the drilling operations in 1973 caused severe damage to large parts of the tractor road between Skratås farm and the mine, their large wheels churning up the road surfacing until many parts became virtual quicksands. It became clear that it was safer to walk on the swamps beside these damaged parts than on (what had been) the road itself. The damages were repaired in the course of summer 1974, paid by Sulfidmalm, but the author himself feels that it was due to the good-will of these owners that reparations on the road were found acceptable, and that the owners did not send us any claim for compensations for the timber from their forests, that were used for their repair work and that the 1973 drill crew felled to make way for the transport of the equipment to the drill site from this road.

Out of regard to the owners we found that we had to make certain restrictions in our geophysical and geochemical work on cultivated ground. The marking of the grid stations and the geophysical work was reduced to the minimum on these fields, and the geochemical sampling was left out altogether. (We did not think that geochemical results would be reliable anyway, over grounds that had been subject to ploughing and chemical fertilizing).

Preparations were made for two other operations, which were planned for the summer, but which were dropped before these were started .

One was the dewatering of the mine in order to permit the mapping of the mineralization underground. As this water eventually would end in the lake which also serves as the drinking-water reservoir of Steinkjer town, certain investigations were being conducted in colaboration with the local and government health authorities in order to be sure that this operation would not result in the poisoning of the reservoir. Following the advice from Toronto, the plan was called off before final preparations were completed. The other plan was the 1974 diamond drilling on EM anomalies from the former work by "Geofysisk Malmleting" in 1950 and from our own VLF and geochemical work. A rough agreement had already been reached with the contractor (NGU drilling department) on this operation. This plan was called off in July - much to the relief of the drilling foreman who still had some unsolved problems with regard to the transport of the drilling equipment in the difficult terrain.

Our mineral rights (muting) had been secured for the whole area between coordinates 600N/1300E, 300S/1300E, 600N/3300E and 300S/3300E. The necessary stakes, fitted with labels provided by the mining recorder (bergmester) were placed in the autumn and we also have received the certificates.

As usual, the geochemical soil samples were sent to Kristiansand for drying and sieving before these were sent to Vancouver for analysis. The results were received in Trondheim as late as mid-March 1975 an unusually long span between the shipment from Steinkjer and the returns. The samples from the mineralized rocks (chip and grab samples) were shipped from Steinkjer at the end of the field season in November/December 1974, to be essayed in the refinary lab. The results returned in the first week of March 1975. However, we are still waiting for the results from a systematic sampling of the dumps outside Skratås mine, and a recheck was requested on the essays of about 10 chip samples which showed suspiciously high base metal values in comparison to the sulfur content.

On the average, three field assistants, students from Trondheim and Steinkjer, were employed in the summer. In the autumn, two local people were employed as field assistants. Their job was mainly the construction of the grid west of the original area, though a fair amount of geophysical work was also carried out by them.

RESULTS OF THE GEOLOGICAL MAPPING

a) Geology in the Skratås grid

The area covered by the Skratås grid was mapped by prof. B. Sturt (central area) in June 1974 by Bj. Lieungh (western area) and by the author (eastern area) in the autumn of 1974.

The geological map in fig. 1 and 1A is a compilation of the work of the three mappers. The rock types found in the area were:

Greenstones:	massive greenstone (acc. to Lieungh metaporohyrite), agglomerate, greenchist (chlorite schist),
Metasediments:	coarse to medium grained quartz-felspar rocks, called grit (Stuart), or greywacke, conglomerate (coasser grit w. larger, rounded fragments, quartz-sericite schists and phyllites, magnetite bearing quartzite (iron quartzites), black phyllite (Lieungh).
Limestone:	actually recrystallised limestone (marble), sometimes with intermittent layers of phyllites.

Polymict conglomerate.

NB. The quartz-sericite schists and phyllites in the metasediments are believed to be phyllonitised greywacke or grit.

The general strike of the foliation of these rocks mostly between W-E and SW-NE, but occasionally WNW-ESE. The dip is generally to the N.

Sturt indicated several folds, all with appr. WSW-ENE axes plunging to WSW. The most interesting fold is probably the synform whose axis goes just south of Skratås mine. Sturt indicated that a thin, megnetite rich quartzite could be mapped here with a closure just NE of the mine, and suggested that this might serve as a marker horizon when attempting to umravel the tectonics in the area. (The attempt to trace this horizon, however, even with the magnetometer, failed). According to Lieungh, the axis of this synform could be traced further to the SW, where he reported greenschist instead of, what one should expect, metasediments. This greenschist was then joined with the underlying greenstone/ greenschist zone in the southern part of the grid area. Further complications were encountered by the author when mapping the area NE of the same synform. A "slab" of limestone could be mapped between Stamvann and the tractor road, while this has no evidence of any surface connection with the large limestone zone in the extreme northern part of the grid. This "slab" clearly overlies the metasediments in the NE, but from its position in relation to the same synform, one would expect this limestone to underlie the same metasediments in the SW. Unless one assumes that both these particular greenschist zone and limestone zone to be just lenses within the metasedimentary sequence and not forming part of the larger greenstone and limestone belts respectively, a rather complex structure, possibly involving backfolding, has to be concluded.

The complex nature of the structure in the area was already demonstrated by Sturt in his report in June, where he indicated that there are at least two folding events have taken place here. The antiforms and synforms mentioned here are F_2 folds. The first generation structures (F_1) are isoclinal folds. The foliation seen in the rocks are axial planar structures relative to the folds, and should not be regarded as bedding. Sturt mentions that the strike of the foliation is usually oblique to the lithological contacts. The original bedding is very seldom seen, and the form of the fold structures could only be established at the limestone contacts and the magnetite quartzites NE of the mine. These markers are, however, very seldom exposed.

b) Mineralization at Skratås mine

The Skratås mine has three entrances, "Fundgruben", "Storgruben" and "Skråsjakt" (inclined shaft). The entrances were cut in several periods, "Fundgruben" soon after the discovery at the end of the last century, "Storgruben" some years after, and the inclined shaft during the last attempt around 1925. These three entrances are connected with each other by underground workings as figure 2 would show.

During the activities in the twenties, the broken ore was sorted into three grades, and dumped at separate heaps outside the mine. The richest ore was called "Prima malm" (first grade ore), now represented by a very small heap outside the entrance of the inclined shaft. This is a massive sulfide ore, and essays are given in the following table:

Prima malm (first grade ore)

	1	2	3	4	5	6	7	8
Zn%	34,37	33,11	33,22	35,10	33,00	34,10	37,71	34,28
Pb%	16,87	15,37	7,87	7,10	10,90	2,86	3,27	14,16
Cu%	1,28	1,60	1,73	-	1,60	6,16	3,99	1,33
Ag g/t	400	387	210	186	300	276	252	384

The next ore type was called "Secunda malm" (second grade) dumped between the entrances of "Storgruben" and "Fundgruben". This seems to be a heavily fractured rock, probably quartzite or grit, with sulfides, carbonate and quartz deposited in the fractures. The essays of this type of ore are given in the following table:

Secunda malm (second grade ore)

	1	2	3	4	5	6
Zn%	14,67	20,22	15,50	17,23	14,55	15,43
Pb%	3,33	6,28	4,20	6,25	4,96	4,70
Cu%	1,40	3,02	1,55	-	-	-
Ag g/t	-	220	-	-	140	168

../8

The third type of ore was called "Småty" (low grade ore) and large dumps of this type are lying between the mine entrances and the tractor road, probably amounting to around a few thousand tons. This is a sulfide mineralized phyllitic rock, sometimes massive grit or quartzite. The sulfide, especially galena and sphalerite, are so finely disseminated that they were often difficult to see without the help of a hand lense. The essays of this type are given in the following table:

Småty (low grade ore)

	1	2	3	4	5	6	7
Zn%	8,75	11,60	8,50	10,40	9,40	9,10	9,70
Pb%	2,50	4,00	3,00	3,60	3,20	2,30	3,40
Ag g/t	-	-	-	128	100	80	100

The above essay figures are derived from a report of the mining engineer R. Støren "The Skratås Zinc and Lead Ore Deposit", 1925, filed in the mining archives in NGU, Trondheim. The description of the ore was the result of our field investigations in the summer of 1974.

During the present work, the dumps of the low grade ore outside the mine were resampled along four lines as shown on fig. 3. The essay results are:

Low grade ore sampled in 1974

	A	B	C	D
Zn%				
Pb%				
Cu%				
S%				

The rocks around the mine are mainly quartz-felspar rocks, called grit in this report, sericite-rich phyllites, iron quartzites and limestone. The mineralization seems to have taken place in the grits and phyllites. The bedrock around the mine is not too well exposed, and the exposures are not always accessible because of the steepness of the cliff walls.

As the mine is flooded the mineralization in situ could only be studied at the surface, i.e.

1. At the entrances of "Storgruben" and the inclined shaft, and between these two points.

2. On a ledge just above the adit of "Fundgruben". This mineralization zone apparently goes down to the adit, but was not accessible in there because of the water level.

Figures 4, 5, 6 and 7 are sketches made of a zone of sulfide mineralization that could be traced from the entrance of "Storgruben" and the inclined shaft.

The other zone of mineralization could be observed over the entrance of Storgruben as a brown and green rust zone, fig. 5. This could be traced to a little pit just over the adit of Fundgruben (fig. 8). Unless one could construe a complicated fold and fault structure, one has to assume that there really are two separate sulfide zones exposed here.

The visible thickness of these individual sulfide mineralization zones is limited, and as a rule not much more than two meters.

The massive sulfide ore zone, which is exposed at and between the entrances of "Storgruben" and the inclined shaft, is not more than 10 cm thick, but is flanked on both sides by a grit with very finely sulfide impregnations. This grit is locally phyllonitised and even brecciated. Cp and py, and to a much lesser extent sp and gn, could be identified. It was rather surprising to see the essay results of the chip samples from these, where the Zn and Pb values were higher than from the zones where galena and sphalerite were more readily recognized.

../10

Chip samples were taken from the mineralized zones along the lines shown in figs. 4, 6, 7 and 8. The results of the essays are given in the following table:

Essay results chip samples (see figs. 4, 6, 7 and 8)

chp. spl. no.	Cu%	Zn%	Pb%	As%	S%	Fe%
1	0,26	4,6	2,3	0,5	2,3	4,6
2	0,54	4,2	4,1	1,0	4,1	4,2
3	0,41	5,2	4,2	0,5	4,2	5,2
4	1,4	4,1	4,0	0,8	4,0	4,1
5	1,6	2,1	8,8	1,1	8,8	2,1
6	0,85	2,2	1,6	0,5	1,6	2,2
7	0,15	4,0	2,0	0,5	2,0	4,0
8	0,14	4,4	3,6	0,5	3,6	4,4
9	0,45	4,8	7,0	1,0	7,0	4,8

Additional information on the mineralization of the Skratås deposit was obtained from the results of the 1973 drilling. DDH 2 gave a 1.70 m intersection of a "quartz-sericite schist with bands and large grains of sphalerite, chalcopyrite and galena" (Hovland report no. 266-73-24). The whole intersection was apparently taken for essaying and can no longer be studied. The surrounding rock is a quartz-sericite schist, this time either barren or with less than 1% sulfides. The essay results of this particular intersection was:

Mineralized intersection DDH 2, 40.0 - 41.7 m

40.0 - 41.0 m	0.10% Cu	7.2% Zn	1.3% Pb
41.0 - 41.7 m	0.22% Cu	3.8% Zn	0.16% Pb

DDH 3 gave a nearly 7 meters' intersection of a breccia of limestone, quartzite and phyllite, with irregular mineralization of py, sp, gn and cp. This breccia lies between quartzitic sericite schists or phyllites (Tan, report no. 345-74-24). Essay results from this intersection are given in the following table:

Mineralized intersection DDH 3, 123.00 - 130.0 m

123 - 124 m	0.12% Cu	0.5% Zn	0.5% Pb	1.5% S
124 - 125 m	0.68%	5.8%	1.8%	4.0%
125 - 126 m	1.0%	5.9%	1.8%	3.9%
126 - 127 m	1.9%	9.4%	3.4%	5.8%
127 - 128 m	1.8%	8.4%	1.0%	4.2%
128 - 129 m	0.14%	0.5%	0.5%	1.0%
129 - 130 m	0.05%	0.5%	0.5%	0.89%

1.345 Cu.
7.375 Zn.
2.00 Pb.

One gets the impression that the "prima-malm" was taken from these thin bands of massive sulfide within the mineralized zones. The "secunda malm" type does not seem to be represented in the mineralized zones which at present are accessible, but it is just probable that the mineralized breccia as intersected at 123 - 130 m depth by DDH 3 was the ore type from which the "secunda malm" was derived. The finely disseminated grits and phyllites which seems to consitute the bulk of the ore at Skratås, represent the "småty" or low grade ore.

It was originally planned to dewater the mine in the summer of 1974 in order to study the mineralization underground. This plan, however, was dropped before it was carried out. The following conclusions were therefore only based on the surface observations and the study of the cores from the two drill holes.

1. The individual ore zones are probably rather thin, around 2 m.

2. There are, at least locally, probably several ore zones close to each other.

3. The rocks near the deposit seem to be strongly folded, sheared and tectonised.

4. The mineralization seems to be irregular.

5. The bulk of the ore body is the finely sulfide disseminated grits and phyllites. According to the essays, they seem to be richer than one otherwise would expect under macroscopic examination. (It might even be an idea to have them them re-essayed!)It was not thought likely thet the "prima malm" is of much significance to the average tenor of the ore body. The significance of the "secunda malm" is not known.

6. DDH 3 seems to prove that the mineralization continues west of the drifts in the mine.

7. Detailed diamond drilling seems to be the simplest way to obtain more reliable information with regard to the mineralization, the metal distribution, the average tenor, and the extent of the Skratås deposit.

../13

Loc. T90:

This showing is essentially a trench, blasted in the bed rock, about 4 meters long, going across the strike of the foliation. The strike is E-W, dip 75° to N. In the eastern wall of this trench, an irregular mineralization was observed in a 1½ meter thick section of the sequence (see sketch in fig. 9). Py, gn and sp were identified. Although the bed-rock on the western wall was very well exposed, no mineralization could be observed here. The impression is that this mineralization is very irregular also in the strike direction.

"Hovlands showing"

This is a very small outcrop at the junction of the tractor road and a track leading to a small gravel pit. DDH 1 of 1973 was placed about 25 meters to the NW from here. The rocks are grit, banded, sometimes phyllitic. The strike of the rocks is E-W, dip 70° to the N. Weak mineralization was observed along a 2 meters' thick section of the grit. See sketch in fig. 10. Chip samples taken across the strike of the foliation essayed:
0,05% Cu, 6,6% Zn, 1,5% Pb, 0,5% As, 1,5% S, 6,6% Fe.
A re-check was requested for the essay results. The outcome of this recheck was not received at the time of writing.

Marken prospect:

This is essentially a big water-filled hole several meters deep. The mineralization could be seen in the dumps just beside. Py, cp and sp was seen here (Sturt). The prospect itself could not be studied without pumping out the water.

It is rather striking to see that these prospects all lie in the metasediments, and invariably close to the boundary with the rocks mapped as greenschists or greenstones.

c) Other mineralizations

A number of showings were inspected, some of these sampled. These showings are, starting from west to east:

Bjønsås prospect,

Loc. T 22 between Bjønsås and Skratås mine (coord. appr. 1850E-75N),

Loc. T 90 (coord. approx. 2550E-25S),

"Hovlands showing" (coord. approx. 2900E-25N),

Marken showing.

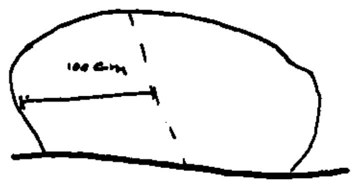
Bjønsås:

Similar, if not greater difficulties were encountered as in the case of the Skratås mine. There are three short adits. The lower adits could not be entered very far because of the water, moreover the walls were covered with a wet slimy limonitic and clayey substance so that an extensive cleaning up operation has to be done before the walls could be studied. The upper adit could be entered for about 25 meters. Also here the walls were covered by a thick coating or encrustation of carbonate and limonitic matter. Some samples knocked off from the walls consisted of massive pyrite, but a very small dump outside the entrance show that massive galena - sphalerite sulfide ore, similar to the "prima malm" at Skratås mine, was also found here.

Loc. T22:

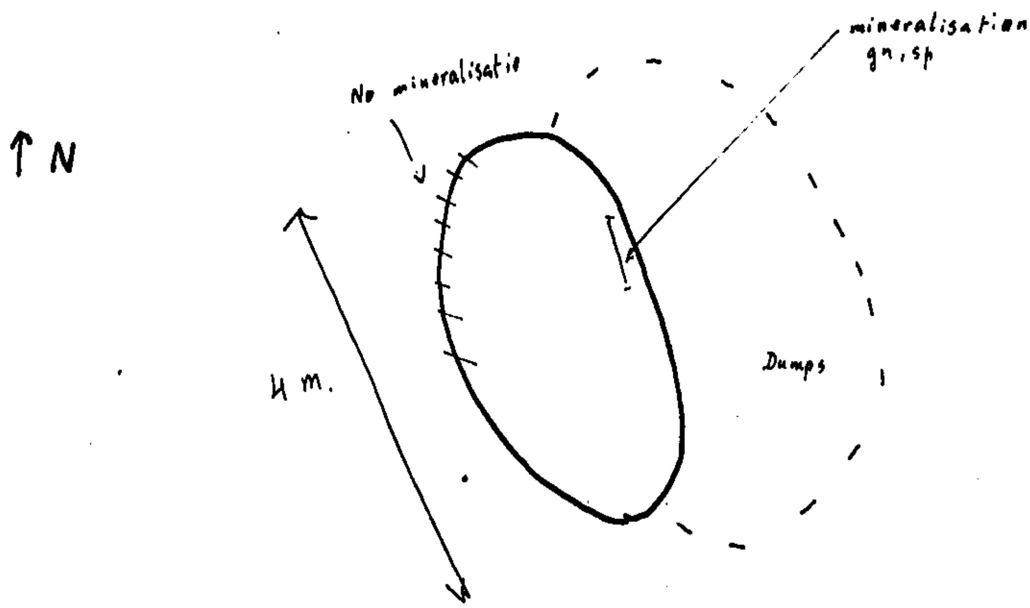
A very small outcrop. The rock is a hard, quartzitic banded grit. See situation sketch in fig. 9. The showing was chip sampled across the strike, essay results are:
0,35 Cu, 6,0 Zn, 3,5 Pb, 0,5% As, 3,5% S, 6,0% Fe.
A re-check was requested of the essay results. The outcome of this recheck has not yet come at the time of writing.

View to W



chip sample 10

Small showing loc T22 near Bjønsås prospect



showing loc. T90. Ground plan

FIG 9

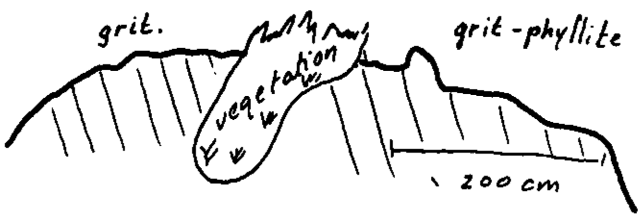
A/S SULFIDMALM

DETAILED PROSPECTING, SKRATÅS, 1974

MAPPING, SAMPLING OF SHOWINGS

SCALE | DRAWN MHT

View to W

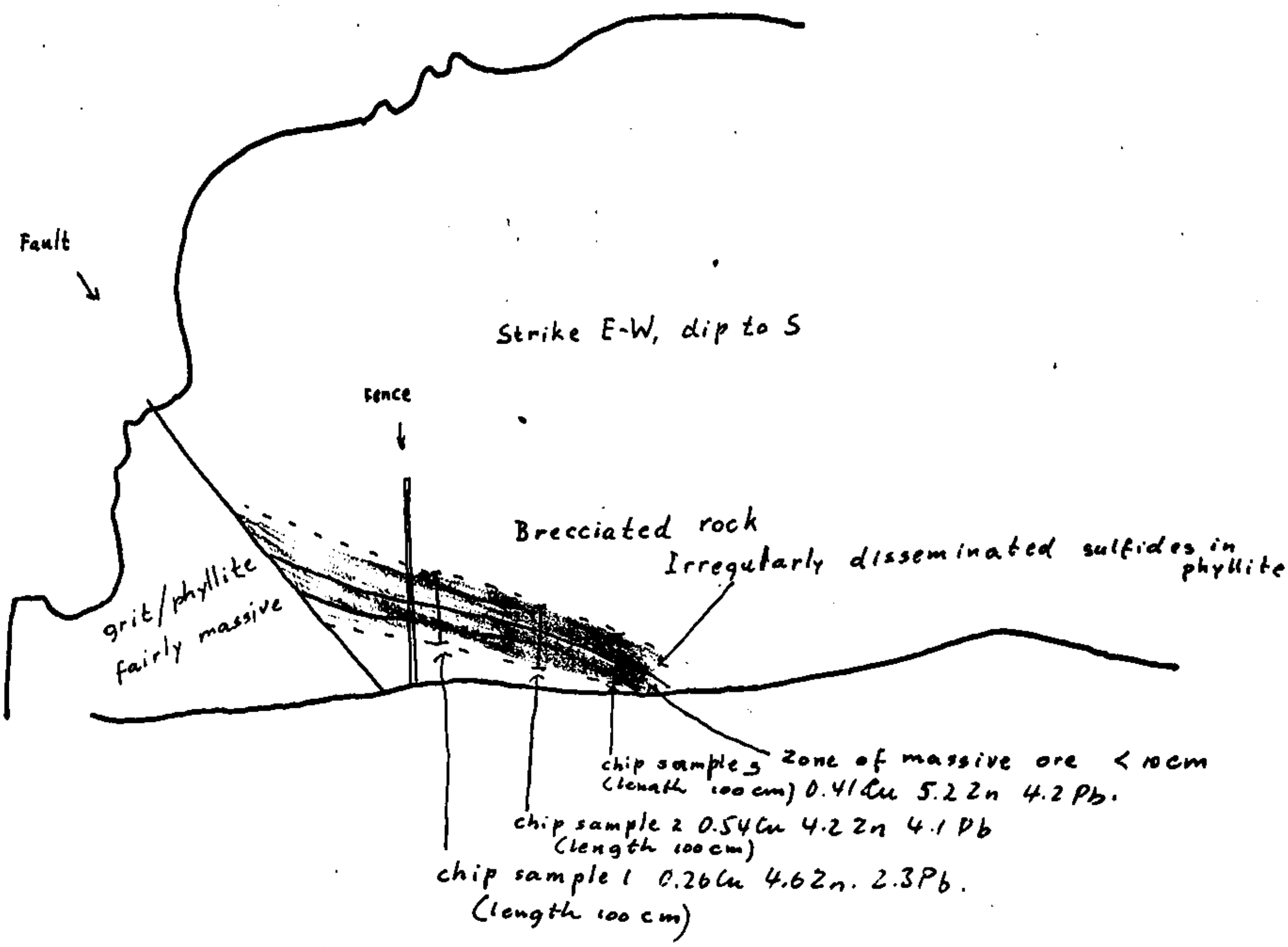


"Hovlands showing"

FIG 10

A/S SULFIDMALM	
DETAILED PROSPECTING, SKRATTÅS, 1974	
MAPPING, SAMPLING OF SHOWINGS	
SCALE	DRAWN TH-T

View to South

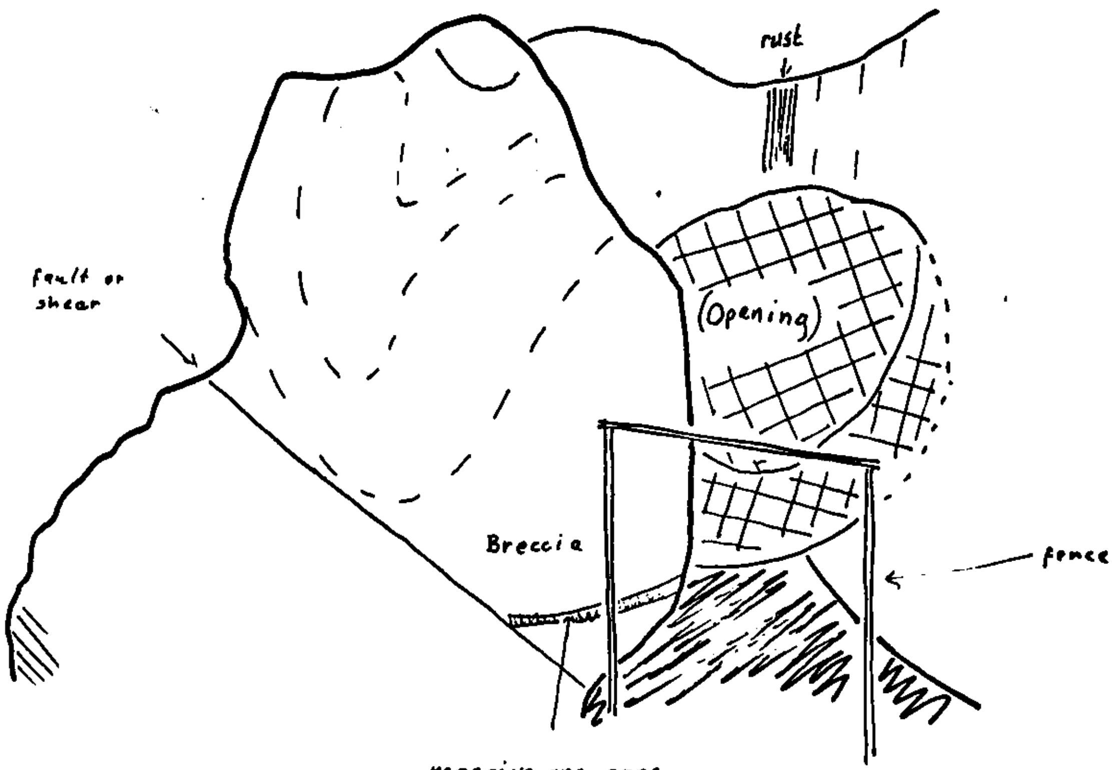


Sketch of wall in entrance of "Storgruben"

Fig. 4. 4.

A/S SULFIDMALM	
DETAILED PROSPECTING, SKRATÅS 1974	
MAPPING AND SAMPLING OF MINERALISATION	
SKRATÅS MINE	
SCALE	DRAWN THT
DATE aug 1974	TRACED THT

View to SW

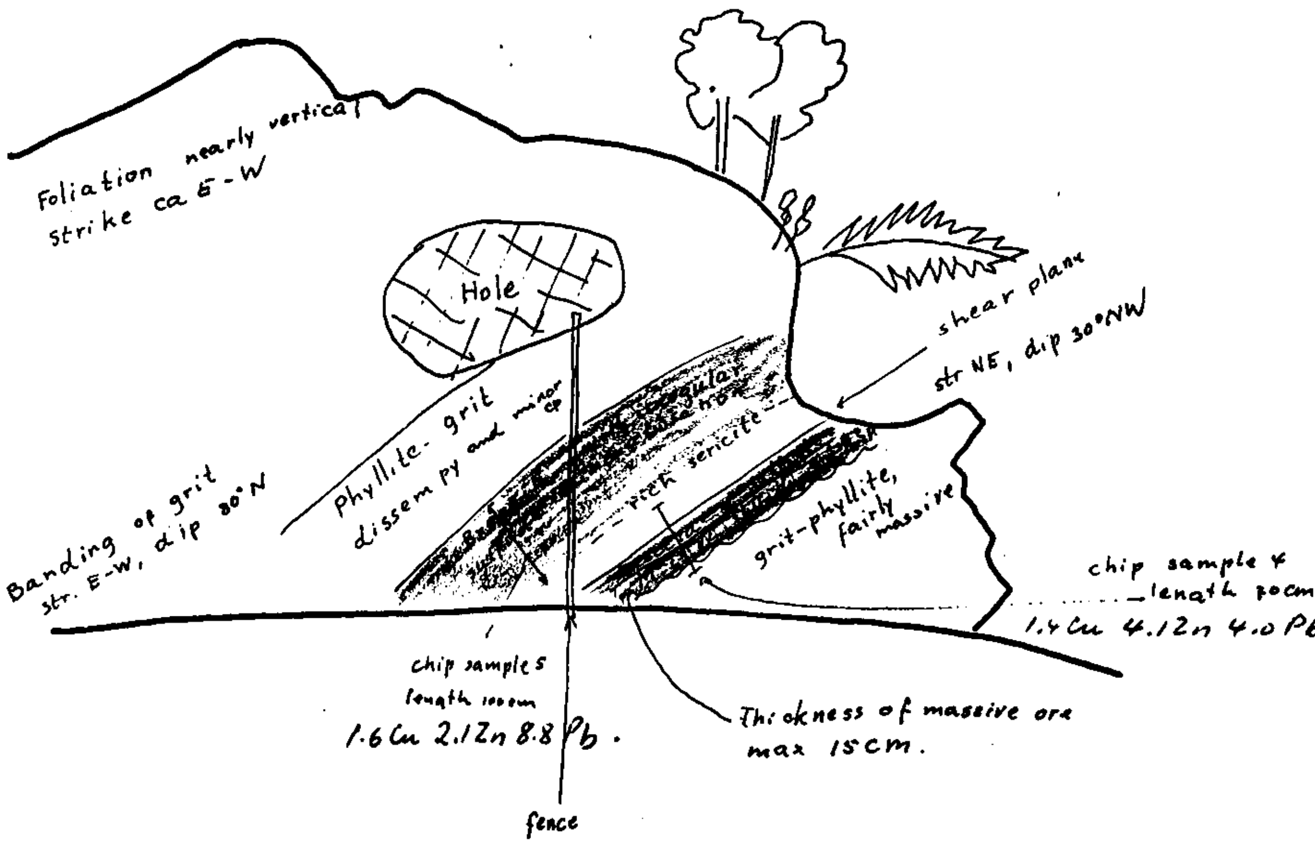


Sketch at entrance of "Storgruben"

Fig. 5

A/S SULFIDMALM	
DETAILED PROSPECTING, SKRATÅS 1974 MAPPING, SAMPLING .. MINERALISATION, SKRATÅS MINE	
SCALE	DRAWN THT
DATE aug 1974	TRACED THT

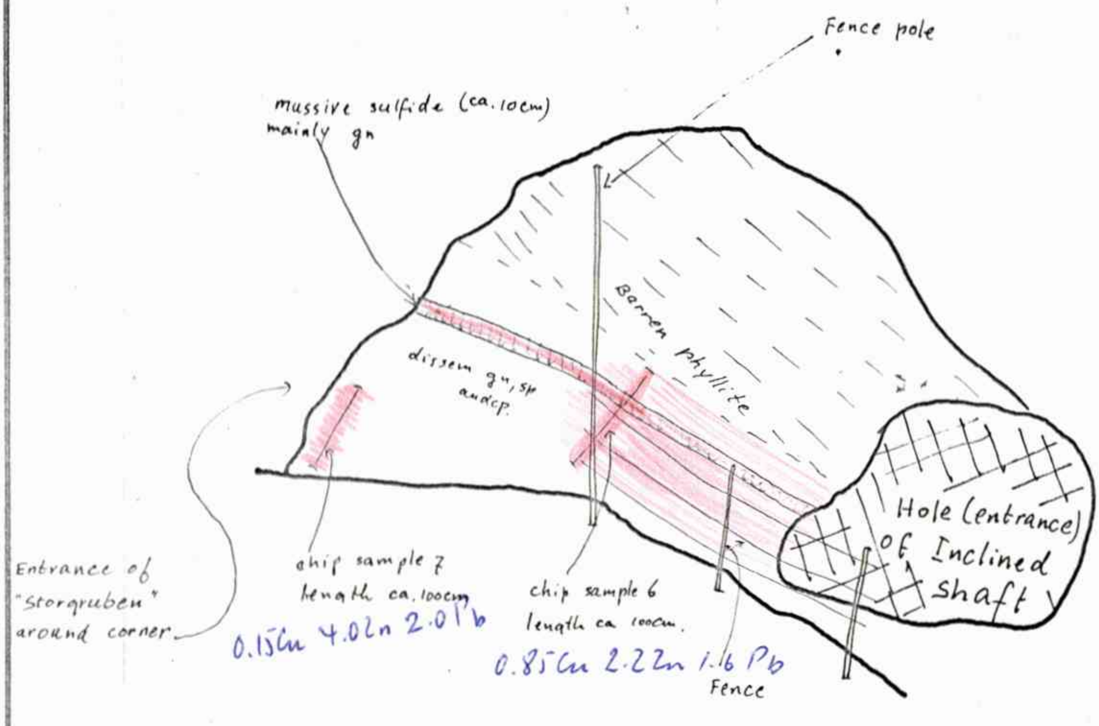
View to North.



Sketch of wall in entrance of "Storgruben"

Fig 6

A/S SULFIDMALM	
DETAILED PROSPECTING, SKRATÅS 1974	
MAPPING, SAMPLING OF MINERISATION	
SKRATÅS MINE	
SCALE	DRAWN THr
DATE aug 1974	TRACED THr



Sketch of cliff wall between "Storgruben" and entrance to Inclined Shaft.

Fig 7.

A/S SULFIDMALM	
DETAILED PROSPECTING, SKRATÅS 1974 MAPPING, SAMPLING OF MINERALISATION SKRATÅS MINE	
SCALE	DRAWN THT
DATE aug 1974	TRACED THT

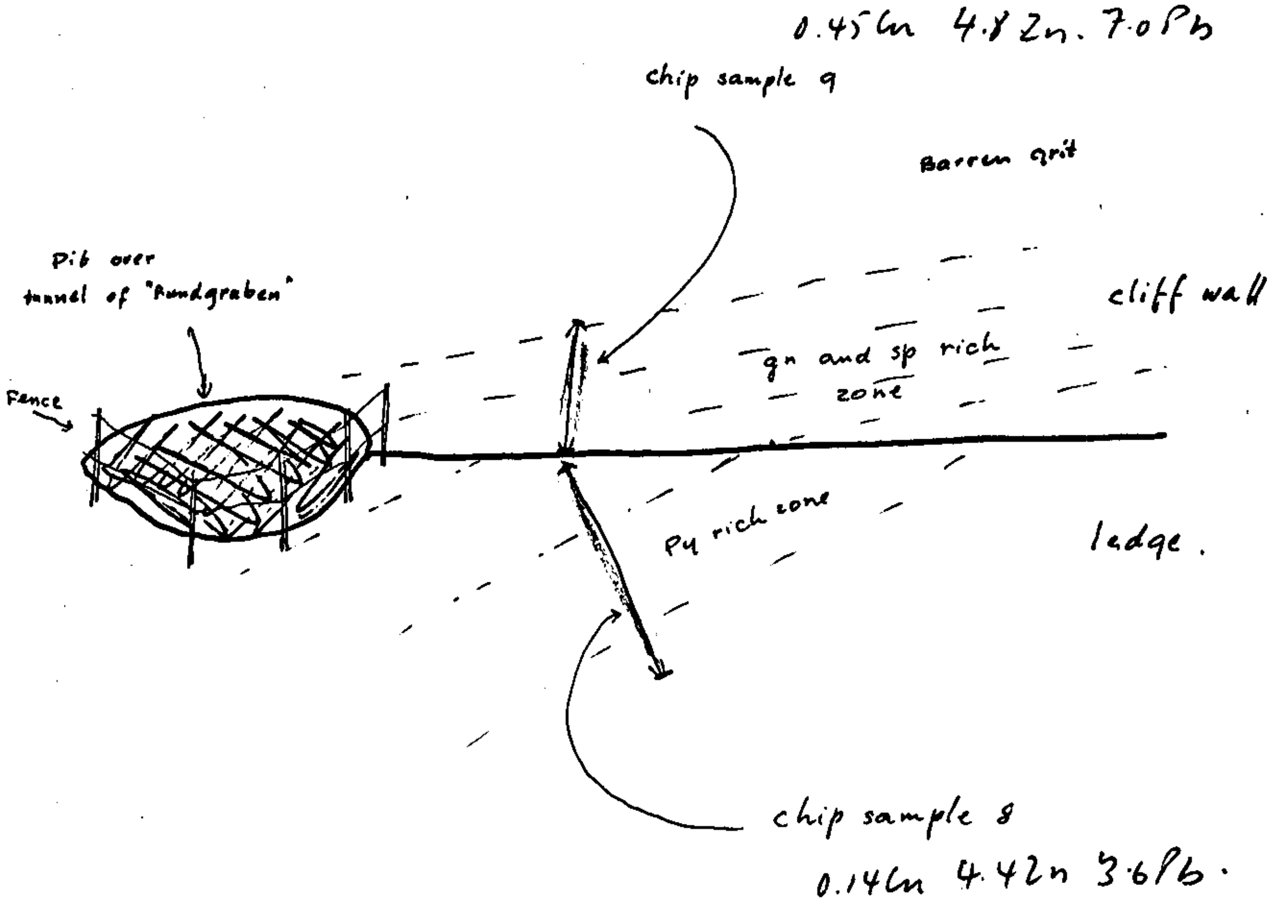


FIG 8

A/S SULFIDMALM	
DETAILED PROSPECTING, SKRATÅS 1974 MAPPING, SAMPLING of MINERALISATION SKRATÅS MINE	
SCALE	DRAWN TMT
DATE aug 1974	TRACED TMT

d) Bedrock mercury survey

A bedrock mercury survey was introduced in the immediate vicinity of the Skratås mine, in order to see whether any indications of a possible extension of the sulfide mineralization would appear.

Two local field assistants were given the task to sample the outcrops according to the same procedure as practised by FNM in Canada. The treatment and analysis was done in Vancouver. The results are presented in map no. 11.

Some samples taken in the immediate vicinity of Skratås mine entrances gave high Hg analysis. No indication of any extension of the mineralization could be seen from these results. It could, however, be an idea to itensify the survey especially along the boundary between the metasediments and the greenstone/greenschist zone. It is moreover felt that more samples could have been collected than actually was the case.

SOIL GEOCHEMISTRY

A soil geochemical survey was conducted in the Skratås grid between 1300E and 3400E. Over 750 samples from the B-horizon were taken, the sampling stations being every 25 meters, lines every 100 meters. The sampling was carried out by students in June and July, and by locally hired field assistants in October/November. The samples were dried and sieved in Kristiansand, and subsequently sent to Vancouver for the analysis for Pb, Zn and Cu. The analysis results were complete mid-March 1975.

The results are presented in figs. 12, 13 and 14, representing the Pb, Zn and Cu values respectively.

Comments in the results:

Pb: No clear anomaly appeared around Skratås mine. Anomalous values turned up at three stations on the line nearest to Bjønsås prospect. The largest anomaly area, however, could be found half-way between Skratås mine and the cultivated grounds of Skratås farm, more or less on both sides of the base-line. This anomaly area lies in the metasediments, near the boundary with the greenstone/greenschist zone.

../16

Some scattered anomalous values were recorded elsewhere, most often near the boundary between the metasediments and the greenstone, and between the metasediments and the limestone.

Zn: The Zn values roughly follows the Pb pattern. No clear anomaly pattern turned up around Skratås mine. Two stations near the Bjønsås prospect had high anomalous values. A rather convincing anomaly pattern could be seen half-way between Skratås mine and the cultivated ground of Skratås farm, near the base line. In addition extremely high Zn anomalies appeared north of the cultivated ground of Skratås. These two anomalies lie over the metasediments near the boundary with the greenstone/greenschists.

Cu: Cu anomalies are conspicuously absent around the Skratås mine and the Bjønsås prospect. Anomalous values begin to appear farther east of the mine. A more or less definite anomaly pattern could be seen just north of the cultivated ground of Skratås farm. Some of these values are suspiciously high.

MAGNETIC SURVEY

A magnetic survey was conducted in the Skratås grid between 1300E and 3400E with a McPhar fluxgate magnetometer.

The line density was usually one line every 100 meters, except in the immediate surroundings of the Skratås mine, where it was 1 in 50 meters. In the eastern part of the grid, however, the laine spacing was less dense because we could not have the instrument long enough with us.

The results are presented in fig. 15.

The anomaly pattern in the immediate surroundings of Skratås mine are very irregular and erratic. The outcropping of magnetite-bearing quartzite, which according to Sturt's report was folded into a synform did not give the expected anomaly pattern. Neither could we trace this iron quartzite any farther with this survey than the geological mapping was able to do.

Elsewhere in the Skratås grid, the magnetic contours seem to go more or less parallel with the strike of the rocks.

VLF-SURVEY

A VLF-survey, with the Geonix EM 16 unit, was carried out in the original Skratås grid (betw. 1300E and 3400E) in the summer. The energy source was the NAA station at Cutler, Maine. (see figs. 16 and 17). In the autumn of 1974 this survey was extended farther westwards until 600E. During this period we used two stations, NAA and in adition, GBR at Rugby, England. This was done because signals from NAA were not received for several days in the autumn and we were not sure whether we otherwise would be able to complete the VLF work in time. This extended survey resulted in two sets of maps, see figs. 16A and 17A (using NAA) and figs. 18 and 19 (using GBR).

A fairly large, and high anomalous area turned up between the Skratås mine entrances and Stamvann. The position of this anomalous area, however, does not quite coincide with the reported position of the ore body according to the old reports.

A medium-sized anomaly in the in-phase component turned up very near the Bjønsås prospect, and it is quite feasable that this anomaly is related to the mineralization here.

Another somewhat larger anomaly, both in the in-phase and out-of-phase component, is to be found near "Hovland's showing". Also this anomaly could have been caused by the sulfide disseminations there.

The boundary between the metasediments and the greenstones/ greenschist in the southern part of the grid seem to be marked by a somewhat higher Fraser values, both in the in-phase and out-of-phase components.

A rather high anomaly, both in the in-phase and out-of-phase components starts to build up at coord. 1300E and 400S, and continues SW-wards. The readings are even stronger when using the GBR station as energy source. The geological data from this part of the area are scanty, one only can indicate that the anomaly probably lies in the greenstone/ greenschist zone.

DISCUSSION

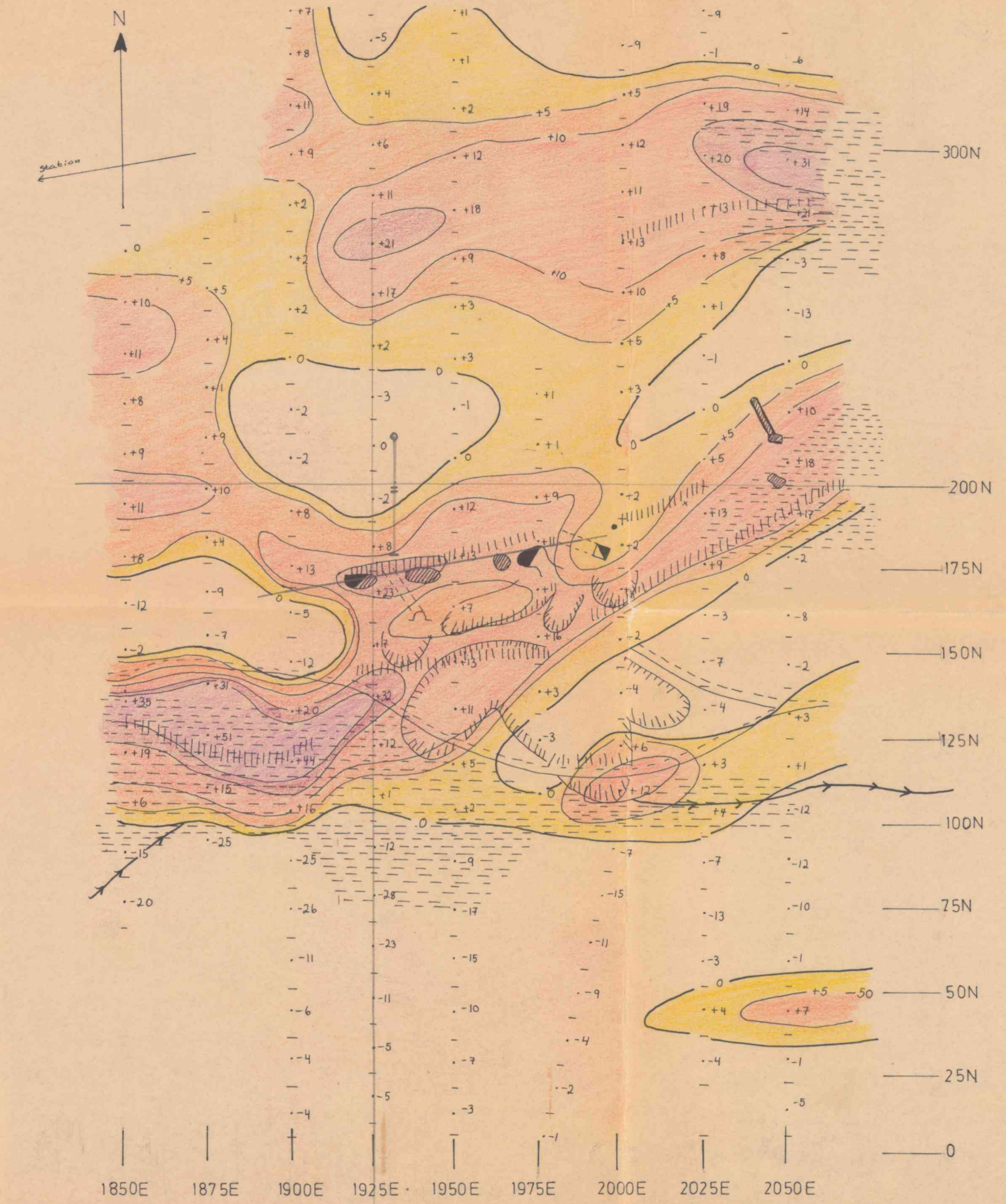
As mentioned in the earlier reports, the Skratås ore body was regarded as a "ruler-shaped" body, dipping to the N, but its longitudinal axis plunging to the W. Reports from the previous underground work indicated that the mineralization continues below the 80 m depth, which was the deepest level reached. The relogging of the 1973 diamond drill cores indicated that this mineralization even continues farther to the W of the drifts cut at that time, and down to a much deeper level. The Skratås deposit did not seem to show convincing VLF anomalies. Before the results of the essays and the recheck of these assays are completed, no comment will be forwarded with regard to the richness of the ore.

One might do well to look further into the metasediment/ greenstone boundary in the southern part of the grid. A more detailed soil and VLF survey, perhaps with more intensive outcrop mapping, seems to be worthwhile.

The other recommendation is to complete the survey (soil, magnetics, geology) in the southern part of the extended grid, where the strong VLF anomalies turned up from the SW corner of the original grid area continuing westwards.

If, however, the completing essays, and the recheck of the other essays give very low values, we might have to conclude that further work on the Skratås project should be given low priotity.

DETAILED PROSPECTING AROUND SKRATÅS MINE 1974	SCALE	SAMPLED BH	7 74
BEDROCK Hg SURVEY	1:2000	DRAW THF	3 75
Hg values in ppb		TRAC THF	4 75
		CHK THF	4 75
A/S SULFIDMALM	fig. 11		



KEY

Mine openings
Dumps
Road
Trench
Swamp
Weak conductor (Turam)
V.L.F Contour (Fraser)

0-5%
5-10%
10-20%
20-30%
>30%
} real component

GROUND GEOPHYSICS SKRATTÅS AREA	SCALE 1:2000	OBS. RH	7-73
		DRAW. RH	7-73
		TRAC. MJ	2-74
		CHK. RH	2-74

A/S **SULFIDMALM**

MAP NO. 226-73-24-07

MAP SHEET

A.s Tørrkopi. 2000. A 2. E 9 gl. 10-71. Sentrum Trykkeri.

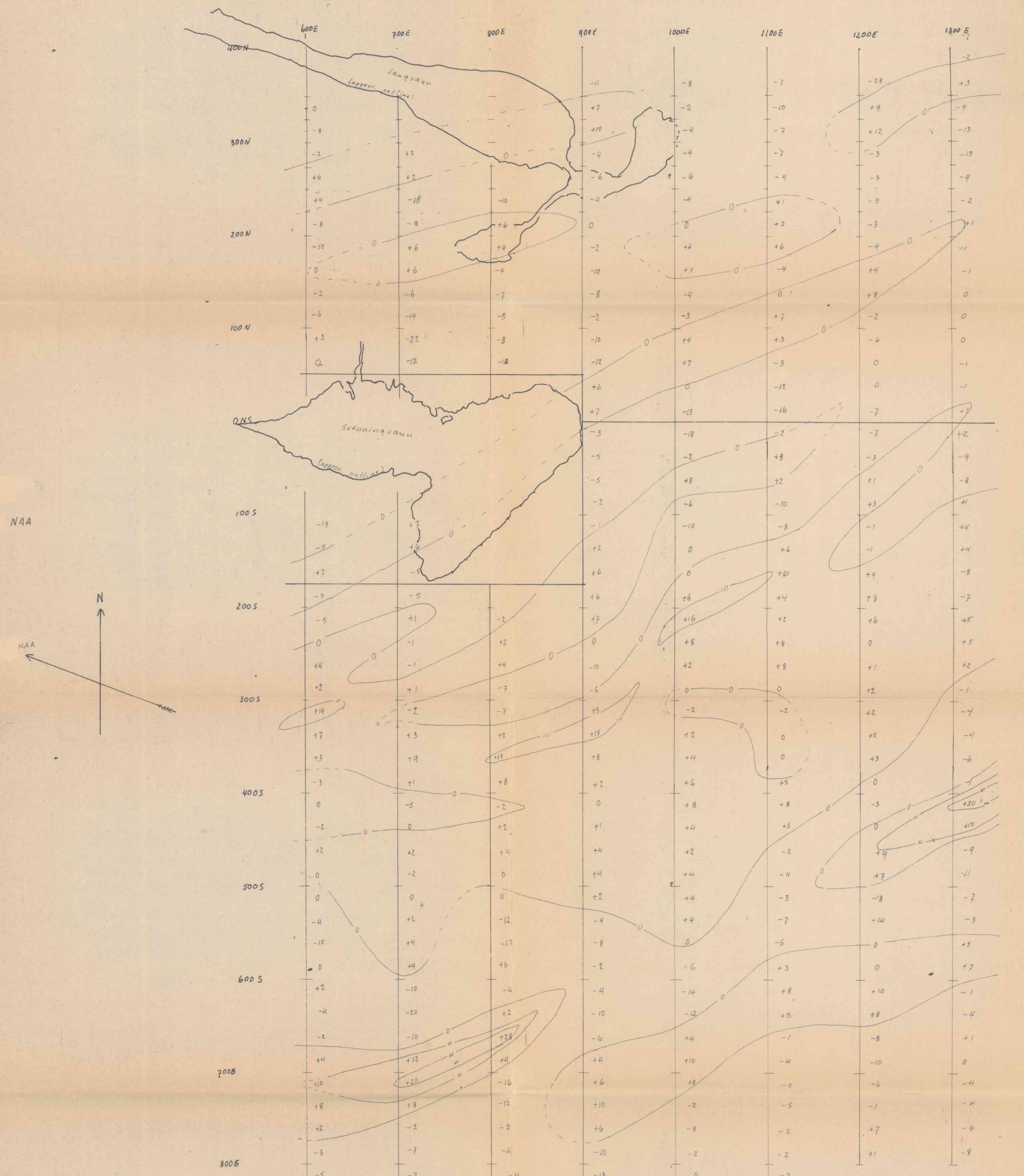
DETAILED PROSPECTING AROUND SKRATÅS MINE 1974	SCALE	OBS AL, MS	7 74
MAGNETIC SURVEY	1 : 2000	DROW THT	8 74
Instr.: McPhar fluxgate magnetometer		TRAC THT	4 75
		CHK THT	4 75
A/S SULFIDMALM	[redacted]	fig 15	

>45 ppm Cu (10% of population)

>65 ppm (5% of papulation)

>90 ppm (2½% of population)

DETAILED PROSPECTING AROUND SKRATÅS MINE	SCALE	SPL MS, BH	7.8-74
SOIL GEOCHEMISTRY	1:2000	DRW THT	3.75
Cu VALUES		TRC THT	3.75
		CHK THT	4.75
A/S SULFIDMALM	Fig 14		



SKRATÅS GRID WESTERLY EXTENSION

DETAILED PROSPECTING AROUND SKRATÅS MINE 1974

VLF SURVEY (STATION: NAA)

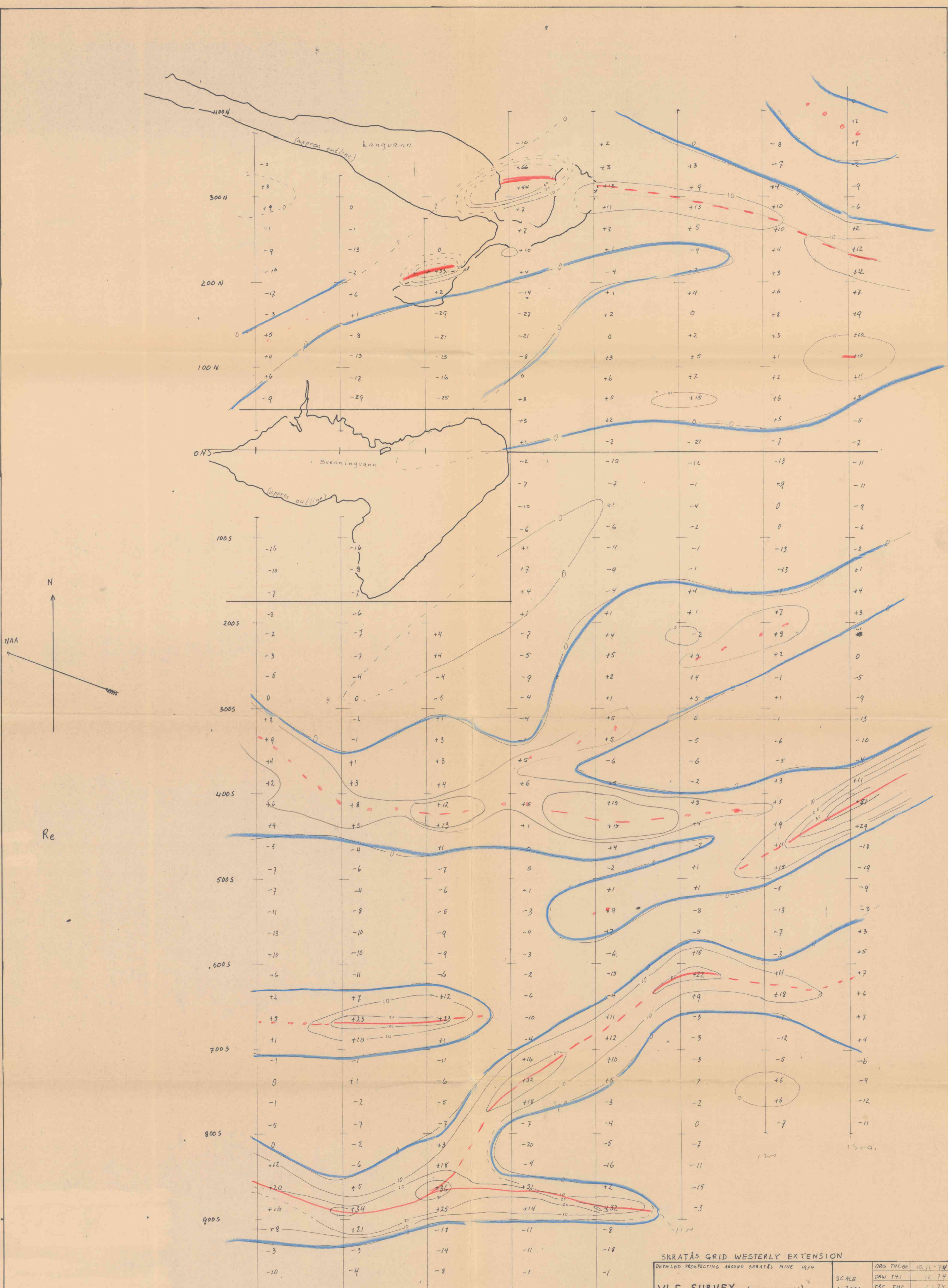
FRASERVALUES FROM OUT-OF-PHASE COMPONENT READINGS

SCALE 1:2000

OBS	THT, BH	10/11–74
DRW	THT	12–74
TRC	THT	1–75
CHK	THT	3–75

A/S SULFIDMALM

[redacted] Fig.17A



SKRATÅS GRID WESTERLY EXTENSION

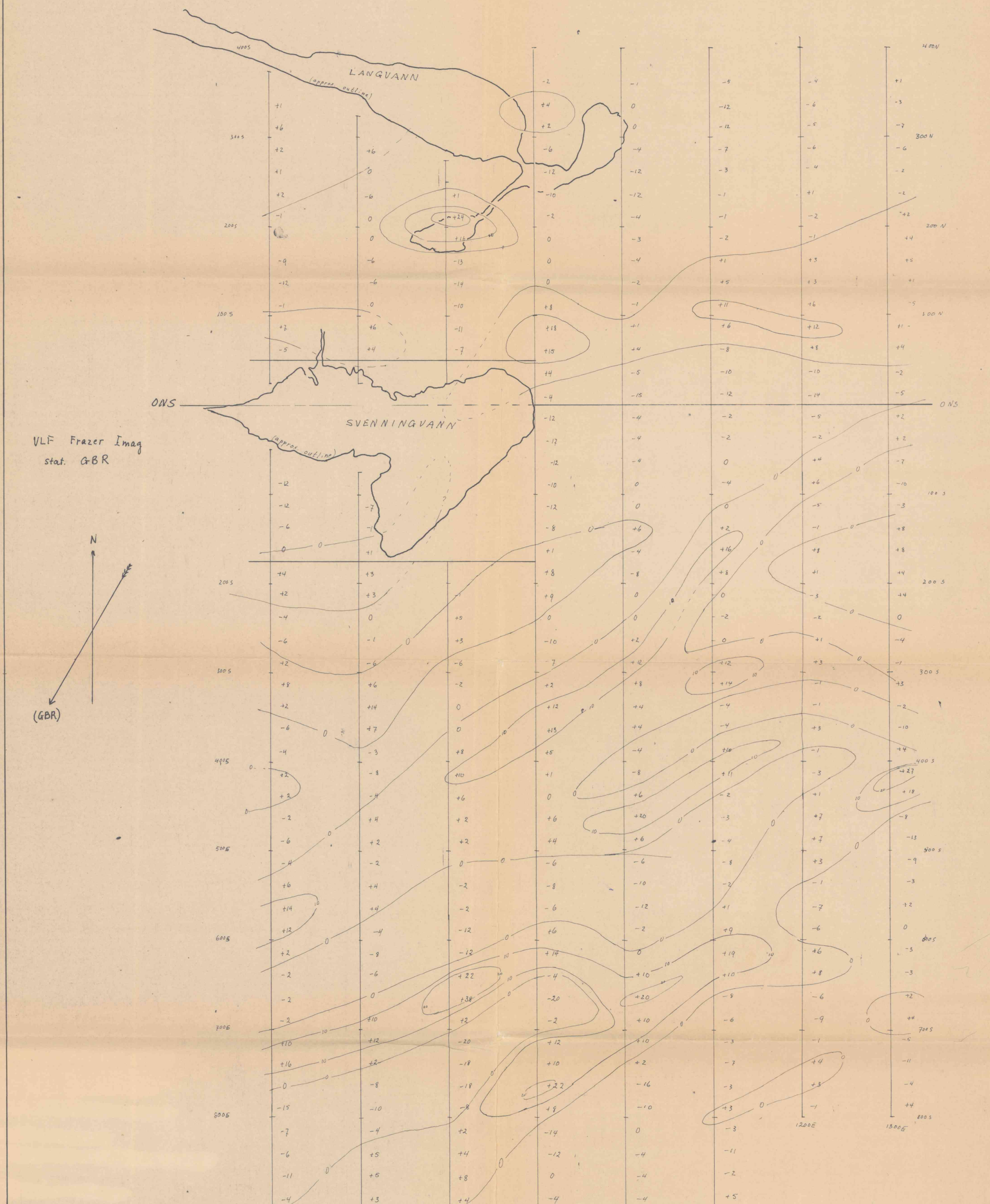
DETAILED PROSPECTING AROUND SKRATÅS MINE 1974

VLF SURVEY (STATION: NAA)

FRASER VALUES FROM IN-PHASE COMPONENT READINGS

SCALE 1:2000	OBS	THT. BH	10.11-74
	DRW	THT	12 74
	TRC	THT	1-75
	CHK	THT	3-75

A/S SULFIDMALM Fig. 16A [redacted]



SKRATÅS GRID WESTERLY EXTENSION

DETAILED PROSPECTING AROUND SKRATÅS MINE 1974

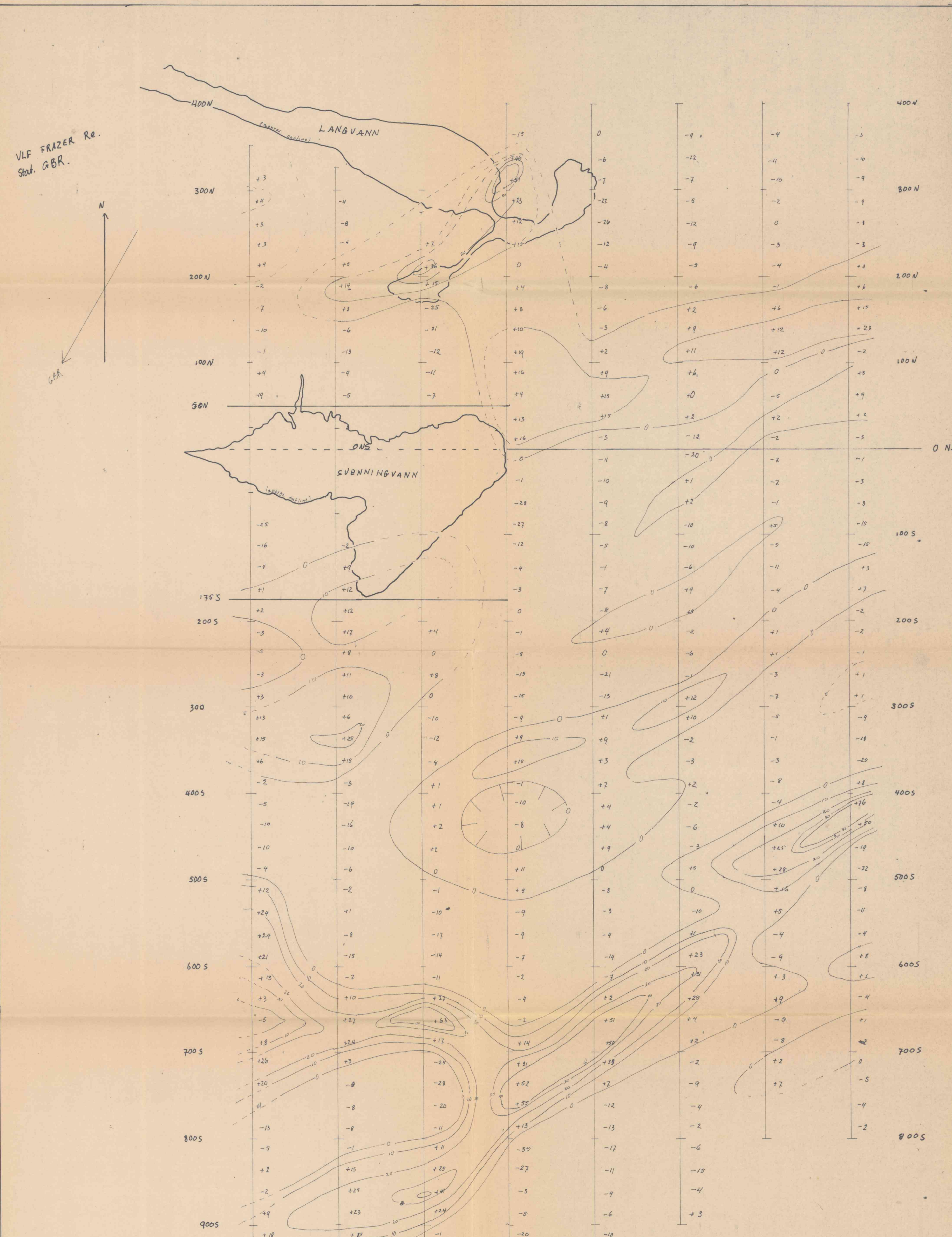
VLF SURVEY (STAT. GBR)

FRASER VALUES FROM OUT-OF-PHASE READINGS

SCALE		
1:2000	OBS BH	10-11-74
	DRW THT	12-74
	TRC THT	1·75
	CHK THT	3·75

A/S SULFIDMALM

[redacted] fig 19



SKRATÅS GRID'S WESTERLY EXTENSION

DETAILED PROSPECTING AROUND SKRATÅS MINE 1974	SCALE	OBS THI, BH	10, 11 - 74
VLF SURVEY (STATION: GBR)	1:2000	DRW THT	12 - 74
FRASER VALUES FROM IN-PHASE COMPONENT READINGS		TRC THT	1 - 75
		CHK THT	3 - 75
A/S SULFIDMALM	[redacted]	fig 18	

DETAILED PROSPECTING AROUND SKRATÅS MINE 1974 VLF SURVEY (STATION NAA) FRASER VALUES FROM OUT-OF-PHASE COMPONENT READINGS	SCALE 1:2000	OBS AL, THT, MS DRW THT TRC THT CHK THT	07-74 08-74 02-75 03-75
A/S SULFIDMALM		[redacted]	Fig. 17

Cu Pb

DETAILED PROSPECTING AROUND SKRATÅS MINE 1974	SCALE	OBS AL, HS, THT	7-74
VLF SURVEY (STATION NAA)	1:2000	DRW THT	8-74
FRASER VALUES FROM IN-PHASE COMPONENT READINGS		TRC THT	2-75
		CHK THT	3-75
A/S SULFIDMALM	[redacted]	Fig. 16	

GEOLOGICAL MAP

SKRATÅS GRID

BASED ON FIELD OBSERVATIONS OF

B. STURT (CENTRAL AREA)

Bj. LIEUNGH (WESTERN AREA)

T. H. TAN (EASTERN AREA)

BASE MAP: ENLARGED AERIAL PHOTOGRAPH OF NORFLY PROJ. 1218 (V73) no. D15

SCALE APPROX. 1 : 2115

DETAILED PROSPECTING AROUND SKRATÅS MINE 1974	SCALE	OBS BS,BL,THT	6-11-74
GEOLOGICAL MAP	1:2115 (approx)	DRW THT	12.74
		TRC THT	1-75
		CHK THT	3-75
A/S SULFIDMALM	Fig. 1.		

KEY:

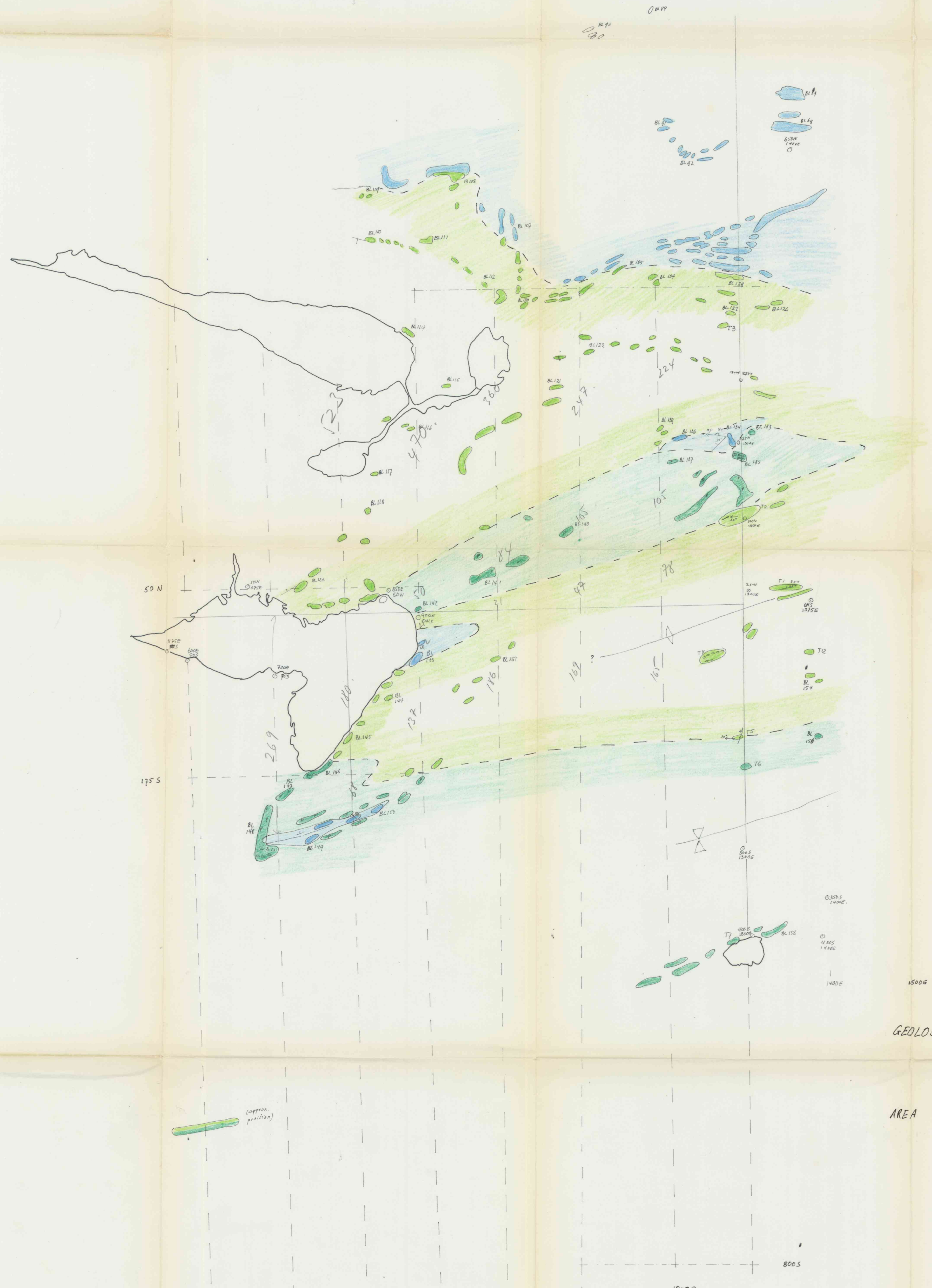
○○○	POLYMICT CONGLOMERATE
	LIMESTONE
	METASEDIMENTS: quartz-sericite schists grit (Sturt) greywacke ○○○○ : conglomerate
	MAGNETITE BEARING QUARTZITE
	BLACK PHYLLITE (Lieungh)
	GREENSTONES: massive greenstone greenschists (chlorite and chloritic schists) PP metaporphyrite (Lieungh) ΔΔ agglomerate (Lieungh) lime-rich greenstone (Lieungh)

(73)	Sturt's observations
BL 73	Lieungh's observations
T 73	Tan's observations
55	Strike and dip foliation
	Antiform axis
	Synform axis

Geological map of **SKRATÅS GRID** Base map: Enlarged aerial photograph of Norfly proj. 1218 (V 73) no. D15	Scale 1:2115 (approx)	Obs. BS, BL, THT 11-74 Draw THT 12-74 Trac. THT, BL 1,7-75 Chk. THT, JG 3,7-75
	Map no.	
A/s Sulfidmalm	**Fig. 1** (345-74-24-1)	
	Map sheet	

SKRATÅS Diamond drillhole no. 3	SCALE 1:500	OBS.	Rtt
		DRAW.	Rtt
		TRAC.	Rtt
		CHK.	Rtt
A/S SULFIDMALM	MAP NO. 266-73-24-09		
	MAP SHEET		

A.s Tørrkopi. 2000. A 2. E 9 gl. 10-71. Sentrum Trykkeri.



GEOLOGICAL MAP OF THE SKRATA'S GRID

AREA WEST OF 1300E

A/S SULFIDMALM

DETAILED PROSPECTING AROUND SKRATÅS MINE 1974

SOIL GEOCHEMISTRY

Zn VALUES

Fig. 13

SCALE		
1:2000	SPL MG, BH	7,8-74
	DRW THT	3-75
	TRAC THT	3-75
	CHK THT	3-75

>35 ppm 10% of population

>80 ppm 5% of population

>150 ppm 2.3% of population

DETAILED PROSPECTING AROUND SARATÅS MINE 1974	SCALE	SPL: MSBH	7-8 74
SOIL GEOCHEMISTRY	1:2000	DRW: THT	3-75
Pb VALUES		TRC: THT	3-75
		CHK: THT	3-75
A/S SULFIDMALM	Fig. 12.		

FOR LEGEND, SEE FIG [redacted] 1

Fig. 1A

SKRATÅS GRID, WESTERLY EXTENSION

DETAILED PROSPECTING AROUND SKRATÅS MINE 1974		OBS BL, THT	10-11-74
	SCALE	DRW THT	12-74
GEOLOGICAL MAP	1:2115	TRC THT	1-75
A/S SULFIDMALM	(approx)	CHK THT	3-75