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Malm/metall	Cu	

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Oppdrag:

A/S NATIONAL INDUSTRI

NGU Rapport nr. 571 B

Geologiske undersøkelser

ULVERYGGEN, REPPARFJORD

KVALSUND HERRED

10. - 30. september 1964

NORGES GEOLOGISKE UNDERSØKELSE

Oppdrag:
A/S NATIONAL INDUSTRI

NGU Rapport nr. 571 B

Geologiske undersøkelser
ULVERYGGEN, REPPARFJORD
KVALSUND HERRED

10. - 30. september 1964

Utført ved : Jan Willem Bruinsma, geolog

Rapporten er avfattet på engelsk

INNHOLD:

Bilag:

Fig. 1 :	Diagram of 206 joint-directions between coord. 9200-9400 X / 10 000-10 550 Y	
Fig. 2 :	Structural map of a part of Ulveryggen	M 1:1 000
Fig. 3 :	Provisional map of the position of the most important E.M. anomalies and their relation to the geology in the coordinate area 9000-9450 X / 9450-9550 Y	M 1:1 000
Fig. 4 :	Provisional map of the position of the most important E.M. anomalies and their relation to the geology in the coordinate area 9400-9600 X / 10 050-10550 Y	M 1:1 000

GEOLOGICAL INVESTIGATIONS IN THE MINERALIZED ZONE ON ULVERYGGEN, REPPARFJORD, KVALSUND HERRED.

September 1964

INTRODUCTION.

The copper deposit of Ulveryggen, Repparfjord, lies nearly 50 km SW of Hammerfest, on the western side of Repparfjord.

From the 10th to the 30th of September 1964 the writer carried out a geological investigation in this locality with the purpose of finding a correlation between copper mineralization and the structure of the rocks.

At the same time the most important geophysical anomalies were checked in relation to the geology of the zone.

SUMMARY OF THE GEOLOGY.

The geology of Ulveryggen and the surrounding area has been described in detail by P. H. Reitan (1963). Ulveryggen mountain is built up by the Steinfjell formation, which according to Reitan is composed of arkosic sandstones with many intercalations of conglomeratic lenses. The minimum thickness is 1000 m.

The grain size of the rocks of the Steinfjell formation varies from coarse to medium fine. In the ground mass sericite is always present, just as chlorite and biotite. The formation has undergone a metamorphism of up to the mid-portion of the greenschist facies. It is therefore better to use the name feldspathic quartzite instead of arkosic sandstone. The name sandstone should be used exclusively for non-metamorphic lithified sand.

Vokes (1957) gives a microscopical description of these quartzites:

"..... the country rocks consists chiefly of clastic grains of quartz and quartzite, ranging in dimensions from about 10 mm to less than 1 mm and showing marked strain extinction. Feldspar, most plagioclase, is a minor constituent and in several of the specimens does not show the 25% content necessary to class them as an arkose. They may be termed feldspathic quartzite.

Sericite and some chlorite occur as thin wisps and shreds interstitial to the elas-

tic grains. The sericite appears to be due to an authigenic crystallisation from detrial clayey material; there is no evidence that it is the result of any alteration process connected with the sulphide deposition. Often it can be seen that the sulphides have filled in between the micaflakes, showing a later age of deposition . . . . . ".

Greenstones and basic dikes are locally intercalated in the quartzite.

Faulting tectonics at Ulveryggen mountain and surroundings are very complicated, as shown by the aerial photographic interpretation of Mr. H. Barkey.

Folding tectonics are gentle.

The mineralization has been described in detail by Vokes (1957).

Like Vogt in 1907, Vokes considers the mineralization as epigenetic, although the possibility remains of a syngenetic origin, with a later secondary mobilization.

The following ore-minerals have been identified at Ulveryggen mountain: (Vokes 1957)

Bornite	Cu_5FeS_4
Chalcopyrite	$CuFeS_2$
Neodigenite	Cu_9S_5
Covelite	Fe_2O_3
Hematite	Fe_3O_4
Magnetite	Fe_3O_4

while as secondary minerals appear:

Malachite	(green colour)	$Cu_2(OH)_2CO_3$
Azurite	(blue colour)	$Cu_3(OH)_2(CO_3)_2$

Owing to a zone of leaching of 15-30 cm, one finds only very little, finely dispersed ore in the quartzite at the present surface.

In 1956 - 1957 an investigation led by C. W. Archibald was carried out on behalf of Invex Corporation Ltd., Toronto, which included diamond drilling and sampling at the surface.

After his investigations in 1956, Archibald constructed 13 lense-shaped ore zones of varying dimensions with a Cu-percentage ranging between $< 1,5\%$ and $> 2\%$ (report Archibald 1956, plate 5). The construction was based on a sampling of 50 larger and smaller trenches, which were blasted in the bedrock in the years 1900 - 1910. These trenches lie about 60 - 80 m apart.

OBSERVATIONS.

The coordinates mentioned in this report refer to the grid laid out for the electromagnetic survey by Geofysisk avdeling in the summer of 1964.

In order to investigate a possible connection between the mineralization and the structural pattern present, a systematic measurement was carried out of all joint systems in the quartzite within the area bounded by the lines 9200 X and 9400 X and the profiles 10 000 Y and 10 550 Y.

The measurements were carried out at 25 m intervals along all existing lines and profiles of the grid.

The measurements were limited to the above-mentioned boundaries as the most important ore-zones (as established by Archibald) are situated here.

The data are plotted in the diagram of fig. 1. This diagram shows that the most frequent (modal) direction is N40° - 50°E. The direction N130° - 150°E is also more prominent than the rest.

The system N40° - 50°E causes a thin cleavage in the rock at many places. Cleavage in other directions was not observed.

Figure 2 is a map of the grid of the area in question. On this map one has indicated the joint systems, the most important fractures, the dip and strike of the bedding of the quartzite, and the position of the mineralized lenses, the latter copied from the reports of Archibald. It appears from this map that the longest axis of the mineralized lenses largely coincide with the principle direction N40° - 50°E. Further relationships between the ore-mineralization and the geology could not be established.

The direction N40° - 50°E appears also to be the most important structural one in the whole area. The bedding is parallel to this direction, from the aerial photographic interpretation by Barkey and several traverses in the surrounding area it appears that the most important fractures and fracture zones are orientated along N40° - 50°E.

In the trenches, which date from 1900 - 1910, it is often noticeable that where the system N40° - 50°E causes a thin cleavage in the quartzite, a strong green colour is generally present, caused by secondary Cu-minerals (malachite).

However, this strong green colour need not indicate a corresponding high ore concentration in the host rock. It is more likely the result of a stronger effect of the groundwater flowage due to the cleavage.

THE GEOPHYSICAL ANOMALIES.

Although the geophysical survey was still in progress, a special investigation was carried out with the purpose to find a geological explanation for the numerous electromagnetic indications. From this reconnaissance it appeared that the greatest number of anomalies are caused by fractures or faults of varying importance. In general, these fractures (or faults) are clearly visible in the topography, but through the absence of key horizons and too much overburden, any possible displacement along the fracture planes could not be established. Some anomalies appear to be situated over basic dikes, for some others one is unable to give any explanation from the geology at the surface.

Fig. 3 and 4 represent provinsional maps showing the position of the most important anomalies and their relation to the geology.

CONCLUSIONS.

From these investigations the following conclusions are drawn:

1. One cannot establish any direct connection between ore mineralization and tectonic structures by surface geology only.

2. No conclusion could be drawn with regard to the continuation of the ore lenses to the depth.

It should be stressed that Archibalds construction of the boundaries of the ore lenses is only an approximation, and that the construction is based on some fixed points in the trenches present. The boundaries of these lenses between points are interpolated as it was hardly or not possible to recognize these boundaries outside the trenches. The reliability of these interpolations over such distances is open to question.

Trondheim 3rd November, 1964

NORGES GEOLOGISKE UNDERSØKELSE
Geofysisk avdeling

J. W. Bruinsma
Geologist

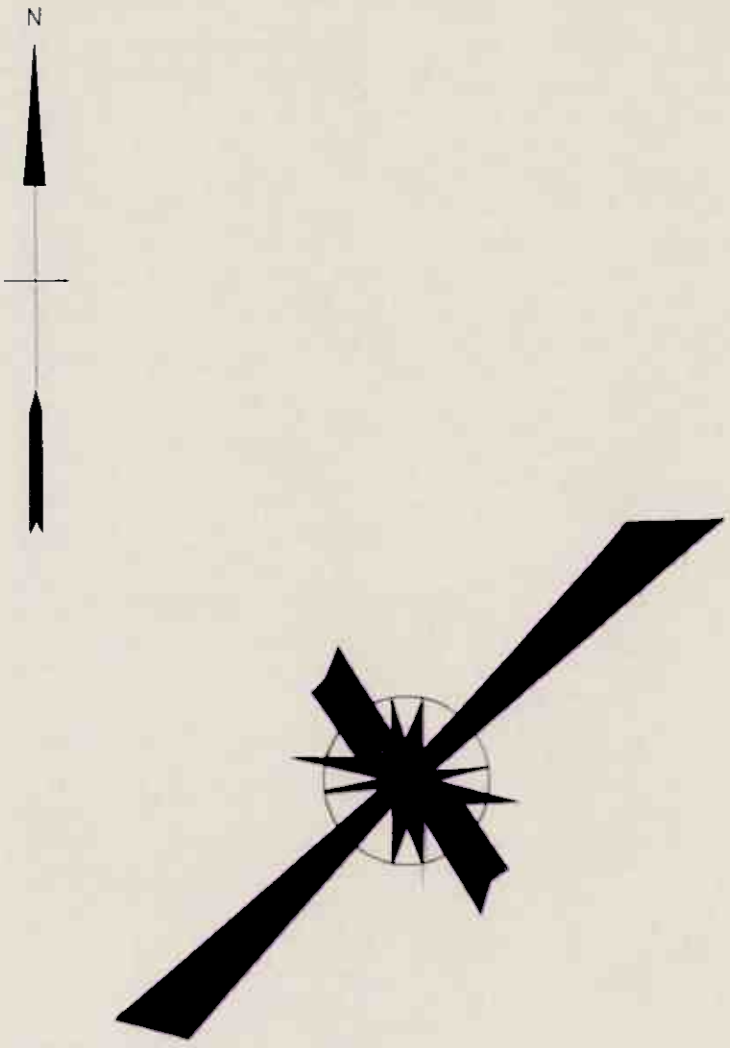

DIAGRAM OF 206 JOINT-DIRECTIONS BETWEEN COORD.
9200 - 9400 X / 10 000 - 10 550 Y.

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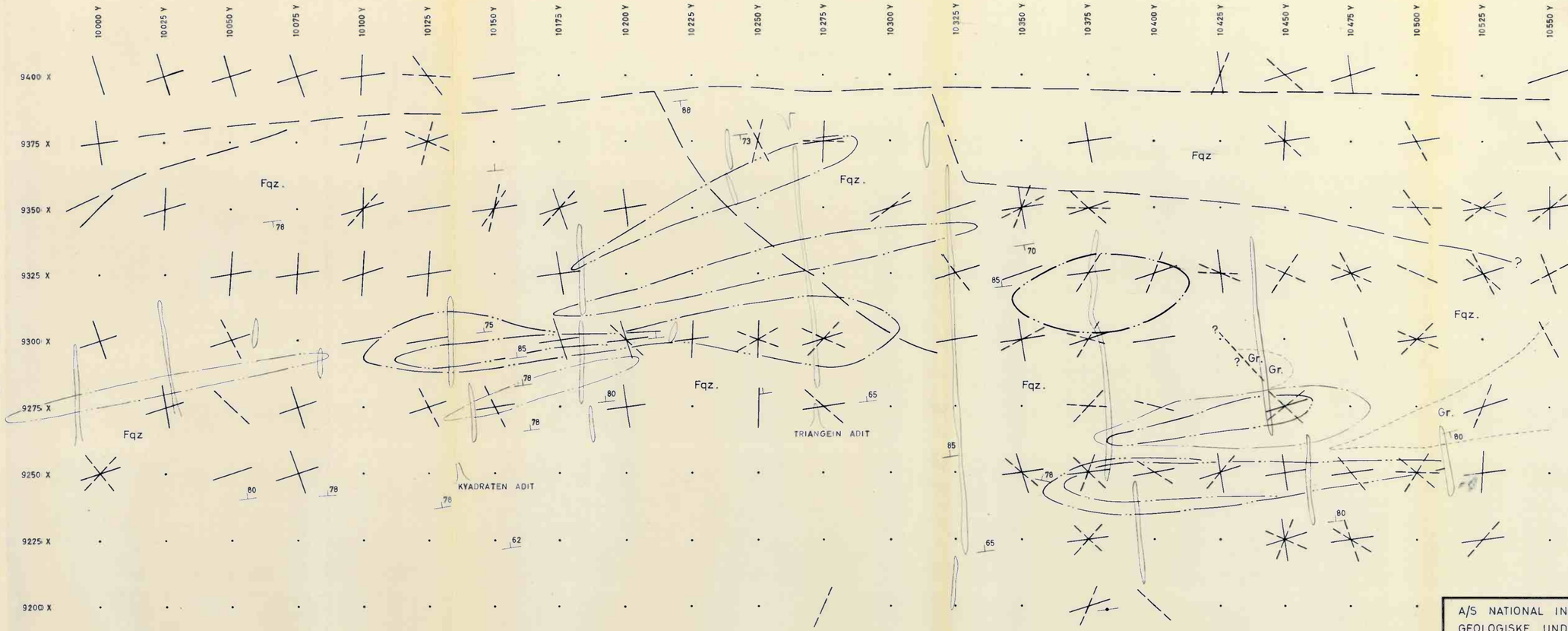
ULVERYGGEN, REPPARFJORD
KVALSUND HERRED

RADIUS OF CIRCLE 4%		
	MÅLT	SEPT. 1964
	TEGN.	OKT. 1964
	TRAC. GG.	NOV. 1964
	KFR.	

NORGES GEOLOGISKE UNDERSØKELSE
TRONDHEIM

TEGNING NR.
571 B – 01



LEGEND:

IMPORTANT FRACTURES [1]
A) PROBABLE
B) POSSIBLE

JOINT SYSTEMS
A) IMPORTANT
B) LESSER IMPORTANT

STRIKE AND DIP OF BEDS [1]

OUTLINE OF ORE ZONES [1]
ZONES OVER 2% CU
BETWEEN 1.5% AND 2% CU.
UNDER 1.5% CU.

TRENCHES AND ADITS [1]

LITHOLOGIC BOUNDARIES [1]
INFERRED

Fqz. FELDSPATHIC-QUARTZITE

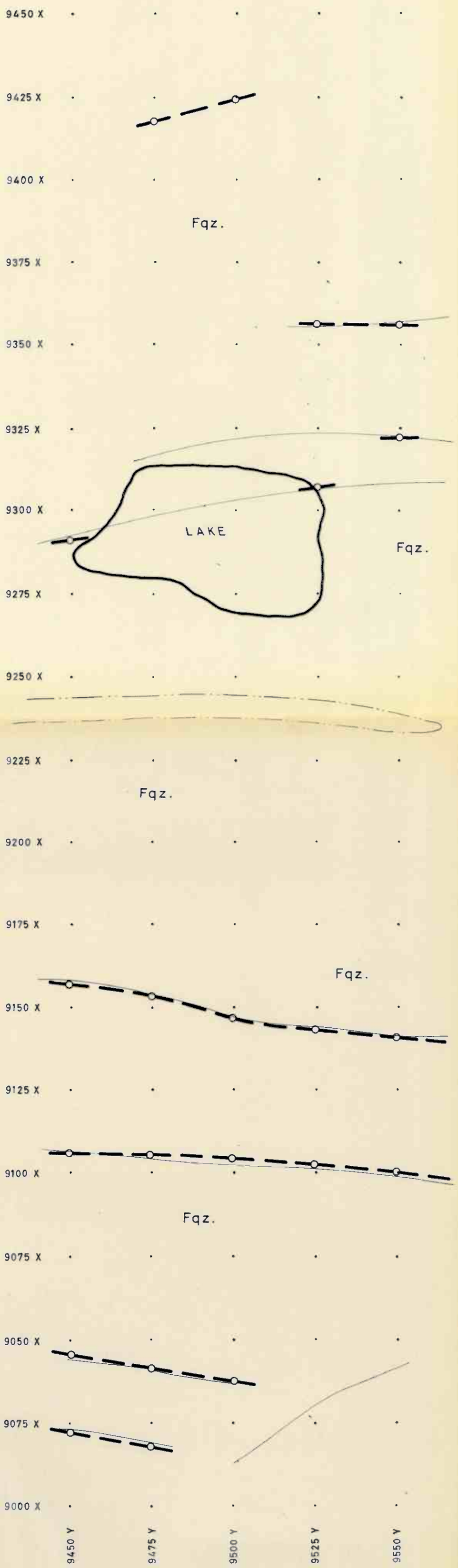
Gr. GREENSTONE

[1] DATA FROM ARCHIBALD 1956/57

N

STRUCTURAL MAP OF A PART OF ULVERYGGEN

A/S NATIONAL INDUSTRI GEOLOGISKE UNDERSØKELSER ULVERYGGEN, REPPARFJORD KVALSUND HERRED	MÅLESTOKK 1:1000	MÅLT JHS	SEPT. 1964
		TEGN JHS	OKT. 1964
		TRAC. G.G.	NOV. 1964
		KFR.	
NORGES GEOLOGISKE UNDERSØKELSE TRONDHEIM	TEGNING NR. 571 B - 02		



LEGEND:

- E.M. ANOMALIES
- FRACTURES
- ORE LENS
- Fqz — FELDSPATHIC QUARTZITE

N

PROVISIONAL – MAP OF THE POSITION OF THE MOST IMPORTANT E.M ANOMALIES AND THEIR RELATION TO THE GEOLOGY IN THE COORDINATE AREA 9000–9450 X 9450–9550 Y

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GEOLOGISKE UNDERSØKELSER
ULVERYGGEN, REPPARFJORD
KVALSUND HERRED

MÅLESTOKK	MÅLT	SEPT. 1964
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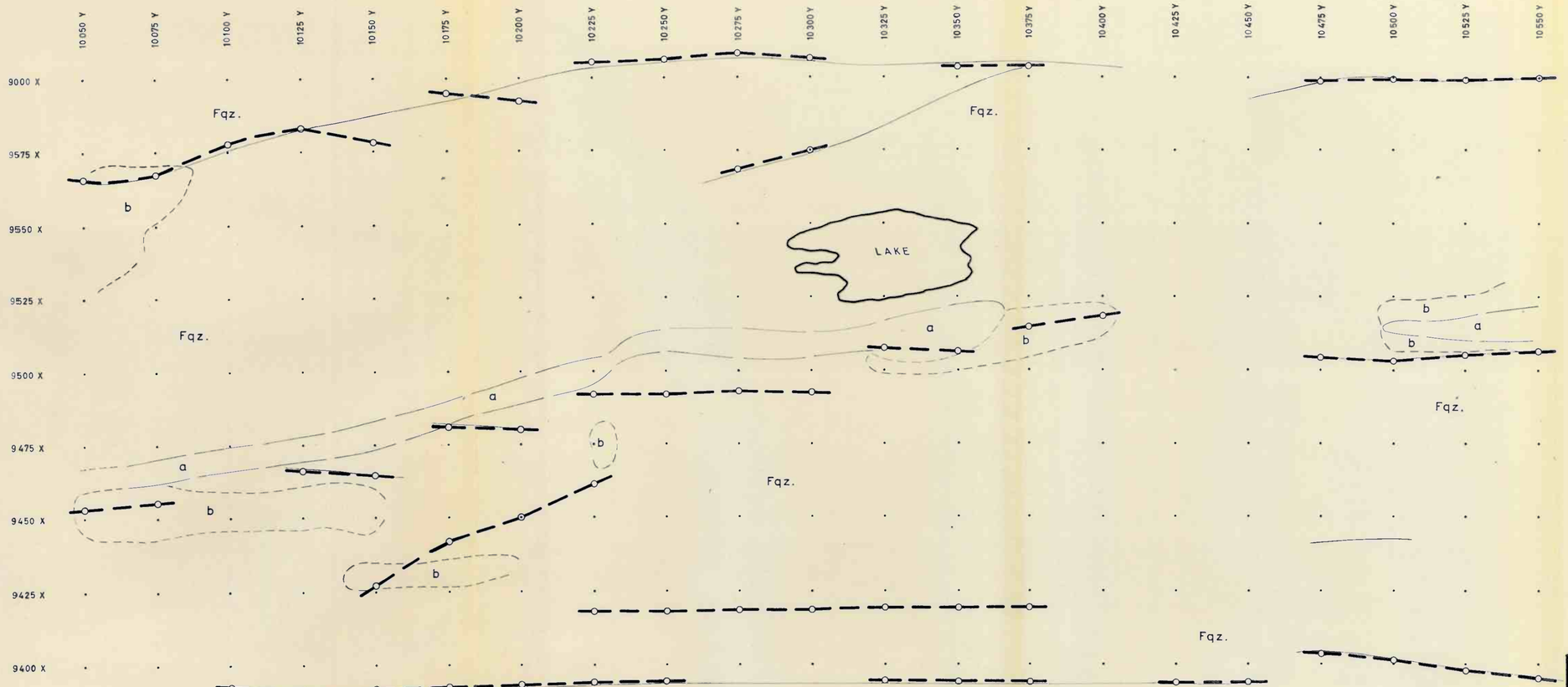
	TRAC G.G.	NOV. 1964
	KFR.	

NORGES GEOLOGISKE UNDERSØKELSE
TRONDHEIM

TEGNING NR.
571 B–03



LEGEND:

- E.M. ANOMALIES
- FRACTURES
- BASIC ROCKS:
  - a) EXPOSED
  - b) DEBRIS
- Fqz. FELDSPATHIC QUARTZITE

N

PROVISIONAL – MAP OF THE POSITION OF THE MOST IMPORTANT E.M. ANOMALIES AND THEIR RELATION TO THE GEOLOGY IN THE COORDINATE AREA 9400 – 9600 X 10 050 – 10 550 Y.

A/S NATIONAL INDUSTRI GEOLOGISKE UNDERSØKELSER **ULVERYGGEN**, REPPARFJORD KVALSUND HERRED	MÅLESTOKK 1 : 1000	MÅLT	SEPT. 1964
		TEGN. TS	OKT. 1964
		TRAC. G.G.	NOV. 1964
		KFR.	
NORGES GEOLOGISKE UNDERSØKELSE TRONDHEIM	TEGNING NR. 571 B – 04		