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Tittel

Progress report of 1972 field work on Numhovd prosjekt. Reconnaissance geology near deposits on Skjønne (Rødberg) mapsheet.

Forfatter	Dato	Bedrift
Malcolm P Annis	1972	Sulfidmalm A/S

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Geologi		Duse Kisgang Hytte Loftsgård Lauvåsen
Råstofftype	**Emneord**	
Malm/metall	Cu Ag	

Sammendrag

M. Annis 1972.

Numedal Copper Showings.

Sulfidmalm rapp
nr. 232-72-15.

Abstract

Stratigraphic units strike approximately north-south and dip steeply both to the east and to the west over most of the map area. Five major map units make up the stratigraphic section. These are, from west to east, amphibolite, quartzite, porphyry, greenstone and associated rocks, and micaceous quartzite. At the 1:50,000 map acale, copper-sulfide deposits occur in two narrow belts within and near the greenstone unit. One follows the western border of the greenstones, with deposits located within a few meters to several tens of meters of the contact with quartzite and porphyry. The second belt is near the eastern border of the greenstone unit within a few meters of the contact with micaceous quartzite. One deposit lies just beyond the contact in micaceous quartzite.

At the deposits, magnetite bearing country rocks are cut by quartz veins. The quartz veins contain chalcopyrite, malachite, bornite and, at three localities, traces of molybdenite. Wall rocks are locally impregnated with chalcopyrite over short distances away from veins, and may be altered to a pink color.

The deposits are epigenetic. Their occurence in magnetite-bearing greenstones in close proximity to siliceous rock units is considered significant.

Introduction

Background

Several copper-sulfide deposits are known to occur in Numedal and at Hovin. They are typically small, so that only a few have been worked extensively. All mining operations in the area terminated long ago. The map of mines and mineral deposits of south Norway (Foslie 1925) shows the Numedal deposits tend to occur along a north-south trending zone. The Hovin area lies on the southern extension of this linear zone. No geologic basis for this linear trend has been previously established, because a well documented account of the regional geology is lacking. However an unpublished bedrock map, without text, indicates lithologic boundaries also trend north-south in the Numedal area ( ).

Objectives of this study

It is the aim of this study to learn the geologic framework in which these deposits occur and, in particular, to identify likely geologic controls

which produced the linear belt of mineralization. Furthermore it is of interest to look for an explanation for localization within the belts, and to see what can be learned about the nature of ore transport to the site of deposition.

Acknowledgements

Professor F. Vokes suggested this study and introduced me to the problems involved. S. Bergstøl assisted in this initial orientation and pointed out the abandoned localities to me in the field. It is a pleasure to acknowledge their support and discussions, and to join this study of the Numedal-Hovin mineralization. A research fund administered by Professor Vokes for studies of ore genesis provided financial support for this work to date.

Field procedures

Field work consisted of traverses across stratigraphic units at widely spaced intervals. Segments of selected contacts were walked out, while others were located from air photographs. The deposits were briefly described, however their poor condition and weathered dumps discouraged extensive field study at this reconnaissance stage.

Field observations were located on 1:35,000 air photographs in the field and subsequently transferred to the Skjønne 1:50,000 map sheet.

Work in the field extended from July 19 through August 2, 1972, and included visits to deposits on the Nore map sheet and at Hovin with S. Bergstøl.

The Stratigraphic Units

Table 1 compares the stratigraphic sequence discussed here with the Bandak series of the Telemark formation given by Dons (1960). The general similarity between these suggests the Bandak series extends as far north as the Skjønne area. Much of the discrepancy on Table 1 may be only apparent, for porphyry lenses seem to occur at several places in the section, including minor lenses in the greenstone unit.

The following unit descriptions are taken entirely from field descriptions.

Amphibolite has been mapped as a separate unit only in the southwest corner of the map area. It is medium grained and contains about equal amounts of plagioclase and dark green hornblende.

Quartzite underlies a large portion of the map area west of the greenstone unit.

Table 1

Comparison of Stratigraphic Units

Skjonne (this study)	Bandak group (Dons 1960)
--micaceous quartzite	--quartz schist with conglomerate
	--marble (locally developed)
	--green lava including one layer of sanstone containing fossils(?)
	--porphyry (acid lava)(may be missing locally)
--greenstone and associated rocks, including pebbly quartzose meta-sandstone, minor porphyry lenses, etc, Cu-sulfide mineralization	--green lava with conglomerate, 3-4 beds of quartzite with conglomerate, irregularly and locally developed layers of quartz schists. Cu-Ag mineralization
	=possible unconformity
--porphyry lenses	
--quartzite	--quartzite (with conglomerate) of varying thickness
	--porphyry of varying thickness, locally missing
	--basal conglomerate and quartzite, the thickness decreasing eastward to zero
--amphibolite	

unit. It is a thick unit of nearly pure quartzite with preserved crossbedding and ripple marks plus other sedimentary structures here and there. In addition to quartz, it contains a few biotite crystals and rare pyrite. Basic dike-like amphibolite bodies, 10-15 meters thick, occur in the quartzite. They have sharp contacts with quartzite, neither unit showing textural or mineralogical modifications at the contacts; and they parallel the quartzite bedding.

Porphyry lenses also occur west of the greenstone unit. One is within the quartzite unit, while the other one mapped occurs between quartzite and greenstone. Typical porphyry consists of a gray, aphanitic groundmass with small white feldspar laths, and often a green mafic mineral, less than 2mm as preserved phenocrysts. It contains little or no magnetite, is hard and glassy. Characteristic "flow banding" can be seen in places. It can be concluded that porphyry-forming extrusions recurred during deposition of the sedimentary section.

Greenstone and associated rocks form a major unit in the central portion of the map area. Most of the unit is green to gray, hard hornfels and softer schist with chlorite and green amphibole as characteristic minerals. Small magnetite crystals occur in several places, and is a common accessory. A variety of other rock types locally occur within the unit and seem to have been lenses and thin beds in a former sedimentary section. These include weakly metamorphosed quartzose sandstone, often with pebbles, locally stretched and schistose, minor porphyry, exceedingly fine-grained meta-shale, and a trace of meta-limestone(?).

Micaceous quartzite underlies the eastern portion of the mapped area. It is light colored, and has more than 80% quartz. Muscovite is the most characteristic mica at most exposures. However biotite is present near the western boundary and again in the east. This is indicated by thin internal contact lines on the map. The micas parallel the foliation and, where abundant, impart a schistosity.

Structural features

The possible Unconformity listed by Dons (see Table 1) is neither confirmed nor rejected by the work to date. More detailed examination at and near both contacts of the greenstone unit may clarify this as well as the proximity of ore.

Faults are thought to be present in more places than marked on the map. Linear physiographic features in the greenstone unit approximately parallel to strike may trace faults or shear zones. The Duses deposit (described below) lies on one of these.

In the southwest corner of the map, amphibolite is in fault contact with the quartzite unit.

A truly large fold appears to be defined by the foliation in these rocks. The accompanying plot of poles to foliation are identified according to three lithologic groups. Poles of the three groups are interspersed and form a continuous progression, or belt, along a great circle of the stereogram. This is interpreted to reflect one large fold. Sedimentary structures in the quartzite indicates the younger rocks are to the east. This means most of the stratigraphic section in the area has been overturned, and that major folding has deformed these rocks.

Notes on Individual Properties

Duses, Kisgang and the deposit at Hytte (called Loftsgård skjerp by Foslie)

all lie at the western edge of the greenstone unit, and will be described first.

Duses occurs in greenschist country rock. The workings follow a planar shear zone marked by thoroughly fractured greenschst wall rock, and the ore-bearing quartz vein. These approximately parallel the strike of foliation away from the zone. The wall rock contains many parallel quartz-calcite veins, traces of malachite, and tiny magnetite crystals. Copper sulfides, malachite and traces of molybdenite occur in the mined quartz veins.

Similar relations can be seen at a prospect about 100 meters south along the shear zone.

The host rock at Kisgang is fine-grained, magnetite-bearing greenschist. The ore occurs in cross cutting quartz veins. The veins are up to 25cm thick and form an intersecting network. The ore mineral, chalcopyrite, occurs in the quartz veins, which also has a few open cavities and malachite. The mine is now flooded and partly caved.

The Hytte deposit lies at the toe of a large dump made during extensive water-tunnel construction nearby. The exposed opening is a small trench about 2 X 15 meters. Here irregular quartz veins again cut fine-grained, magnetite-bearing greenschist. These veins are generally 10-25cm thick, but only locally contain calcite, chlorite and copper sulfide minerals.

Lauvaasen and two "skjerps" form the eastern group of deposits.

Lauvaasen lies near the eastern border of the greenstone unit. The host rock is a purplish gray, magnetite-bearing porphyry lense, which locally becomes pink. The ore is associated with a series of quartz veins. Many veins parallel foliation and are barren, even though offshoots trending across foliation contain chalcopyrite and, where weathered, malachite. The sulfide minerals are more concentrated along quartz veins in the pink colored rock and near inclusions of porphyry in the veins. In addition to quartz, the veins contain calcite, chlorite, copper sulfides and traces of molybdenite. Malachite is also present on many surfaces. The mined zone is less than 5 meters wide. Immediately north of the mine, only four quartz veins were seen in outcrop. There may be more south of the mine beneath the soil cover.

The southern skjerp, or prospect, has relations similar to Lauvaasen. The deposit is in dark gray, very fine grained hornfels. Near the ore it becomes pink colored. Here a series of irregular quartz veins approximately

parallel the regional foliation. The wall rock is also mineralized and has many open spaces. The ore zone is less than 2 meters thick, and individual veins are less than 25cm thick. They contain quartz, calcite, chlorite, biotite, copper sulfides, molybdenite and a trace of tourmaline(?). Magnetite is present in the gray rocks enclosing the deposit.

The northern "skjerp" is not a true prospect. It occurs immediately below a low dam and apparently forms part of the dam foundation. It may have been exposed during dam construction. The deposit lies immediately east of the contact between greenstone and micaceous quartzite. Porphyritic micaceous quartzite with k-feldspar crystals about 1cm across, and with biotite instead of muscovite forms the country rock. It is cut by many quartz veins which contain bornite, malachite, a little pyrite and a trace of azurite, as well as inclusions of the metamorphic rocks.

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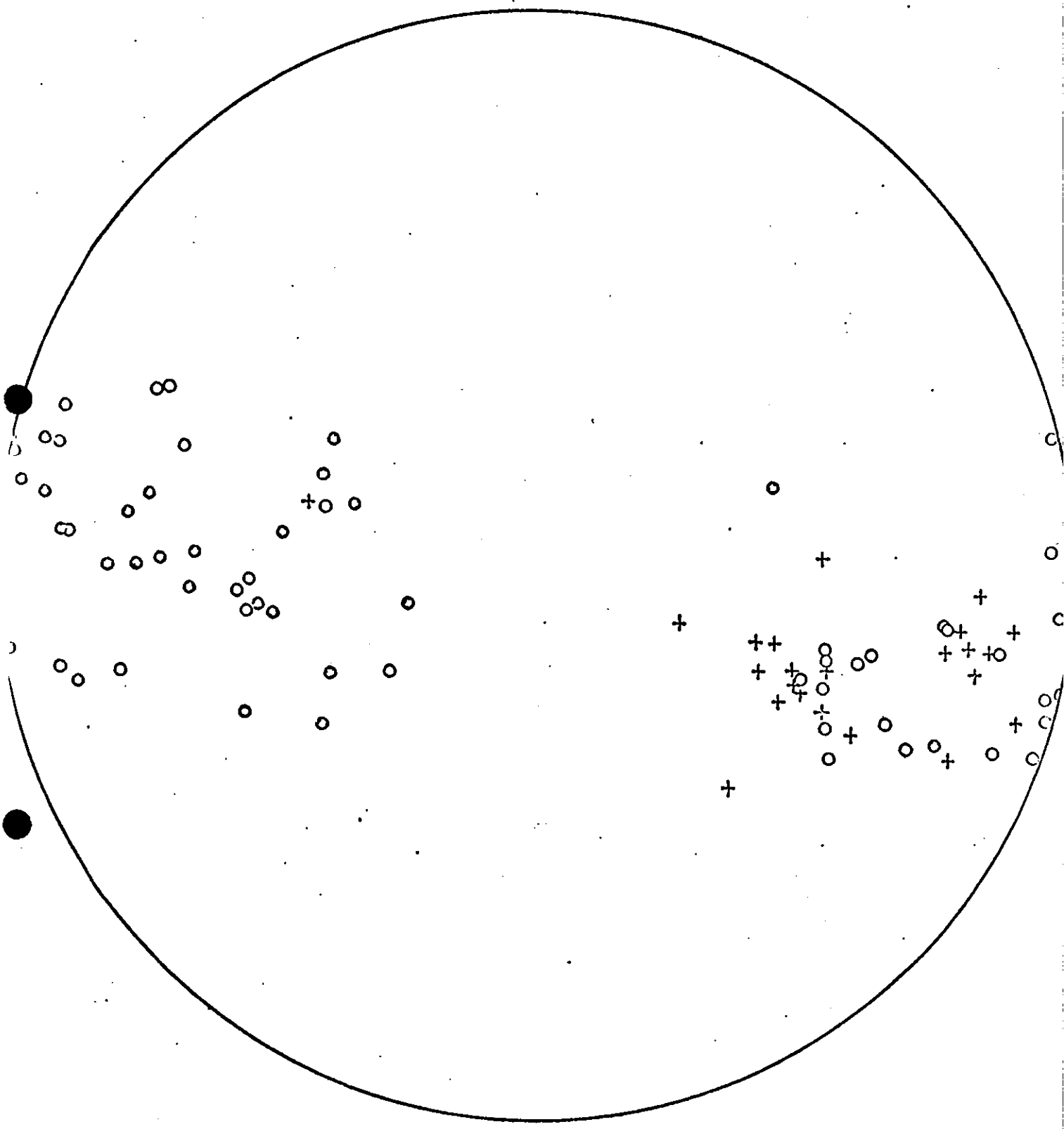
References

Dons, J. A., 1960, Telemark supra crustals and associated rocks. in Holtedahl, O., Ed., Geology of Norway, Norges Geol. Undersøk. nr. 208.

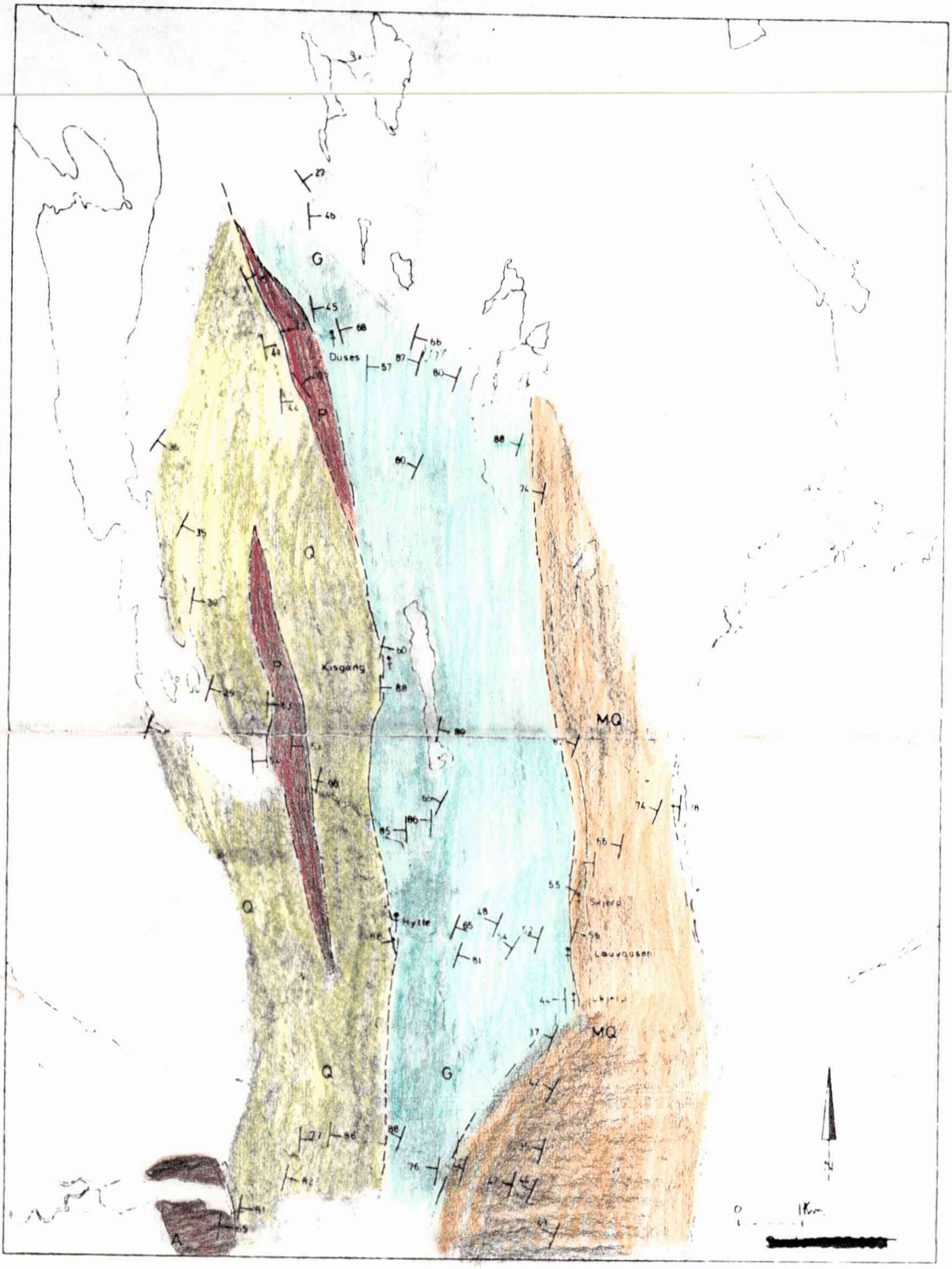
Foslie, S., 1925, Syd-Norges gruber of malmforekomster. Norges Geol. Undersøk. nr. 126.

POLES TO FOLIATION
(lower hemisphere)



- ◦ Quartzite, porphyry
- o Greenschist and associated rock types
- \+ Micaceous quartzite

RECONNAISANCE GEOLOGIC MAP OF THE SW PORTION OF SKJØNNE MAP SHEET



G Greenstone and associated rocks

MQ Micaceous quartzite, partly schistose

P Porphyry

Q Quartzite

A Amphibolite

Strike and dip of foliation (parallels bedding in quartzite locally overturned)

Unit contacts, dashed where approximately located dotted where inferred

Mineral deposit

Lakes

November 1972

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