

GENERATIVE PROJECT

Exploration Potential for Gold, Silver, and
Molybdenum in Nordland, Norway

FOLLDAL VERK A/S - AMOCO NORWAY OIL COMPANY

February 1983

Prepared by: Dr. Michael Krause

Undersøkelser Nordland

forslag Krause.

- 83

1. Håfjell - området. Jordprøvetaking over relativt stort område.
2. Rombak - området. Geofysikk - geolytisk og geologisk kartlegg. Behøver våre erfaringer i felt. ∴ vi trenger en gruppe på 4-5 pers. over ca. 2 mnd.
m/ CEM, VLF, Mag.
3. Bindal - Sverningdal - området. Sedimentundersøkelse, rel. stort område med dårlige adkomstmuligheter, vil nok være 6-8 pers. over en 2 mnd. periode.

Anslåtte kostnader:

Lønn 15 pers. i 2 mnd.	$\Rightarrow 15 \times 20\,000 \Rightarrow 300\,000,-$
Reise, opphold etc.	$\Rightarrow 50\,000,-$
Analyse av ca. 7000 prøver á 60,-	$\Rightarrow 420\,000,-$
Div. uforutsett	100 000,-
Total	<u>870 000,-</u>

TABLE OF CONTENTS

	Page
Summary and Conclusions	3
1. Introduction	4
2. Location and Access	4
3. Regional Geology of Nordland	4
4. Exploration Potential for	
4.1 Gold	7
4.1.1 Bindal Area	7
4.1.2 Skjerstad near Bodö	8
4.1.3 Häfjell Syncline in Ofoten	9
4.1.4 Rombak Window	10
4.1.5 Buktedalen/Tysfjord	12
4.2 Silver	12
4.2.1 Area around Svenningdal	12
4.2.2 Mofjell Area	14
4.2.3 Nasafjell Area	15
4.2.4 Beiarn Area	15
4.2.5 Mikkelfjord/Hatfjelldal	16
4.3 Molybdenum	16
4.3.1 Andalsbatten	16
4.3.2 Laksadal/Oterstrand	16
4.3.3 Leirjordfall/Tjaedalskampen	17
4.3.4 Risatind/Rishaugfjellet	17
4.3.5 Solskinnsbak	18
4.3.6 Kalvik/Rismålsheia	18
4.3.7 Vatterfjord (Helle) Mine	18
5. Land Status and Competitor Activity	19
6. Summary of Proposed Investigations	20

Summary and Conclusions

This report outlines exploration targets in Nordland, in areas with known Au, Ag, or Mo mineralization. Several areas are discussed and some are proposed for exploration.

Five different areas with Au mineralization are known. In the Bindal area gold occurs with arsenopyrite in quartz stockworks within granitic intrusives that intruded into the Caledonian sediments. At present A/S Sulfidmalm has a larger drilling program in this area. In the Skjerstad area, near Bodø, gold is reported in quartz veins together with arsenopyrite. No investigations are carried out at these mineralizations at present. In the Håfjell syncline, Ofoten, gold mineralizations occur within quartzites. The genesis and the type of the occurrences is unclear. Soil sampling is proposed in this area. In the Rombak area, northern Nordland, Au, As mineralizations occur within the Precambrian basement. Claims were staked by Polldal Verk at these occurrences. Ground geophysics and geochemistry including geological mapping are proposed to outline drill targets. The area seems very interesting for further exploration as several other arsenopyrite occurrences are described from the area. Another gold mineralization is described at Buktedalen within the Caledonian nappes in the area west of the Rombak window.

Silver mineralizations are known in the area of Svenningdal with minor amounts of gold. The mineralizations occur close to the contact with the Reinfjell granite within calcareous sediments. A stream sediment survey is proposed between the Bindal and the Svenningdal area in the search for economic Au, Ag mineralization. The silver occurrences in Nordland are predominantly bound to Pb, Zn ores. This type is known from the Mofjell-, Nasafjell-, and Beiarn area, too. At present Sydvaranger conducts exploration in the area of the Mikkeljord silver occurrence, east of the Svenningdal area.

Several Mo occurrences are known throughout Nordland. All are bound to granites or sediments close to the contact with the granites. At present the old Vatterfjord mine on Lofoten seems to be interesting for further exploration.

Of all the areas discussed, the Rombak window seems to be the most promising one for exploration.

1. Introduction

This report outlines new exploration targets in areas with known Au, Ag, or Mo mineralization. A considerable amount of reports and publications about old mines, prospects, mineralizations, and the geological environment they are located in had to be studied. The purpose of the studies was to sketch major or minor metallogenic provinces, in which economic gold, silver, or molybdenum mineralization can be expected. Some areas are proposed for exploration.

2. Location and Access

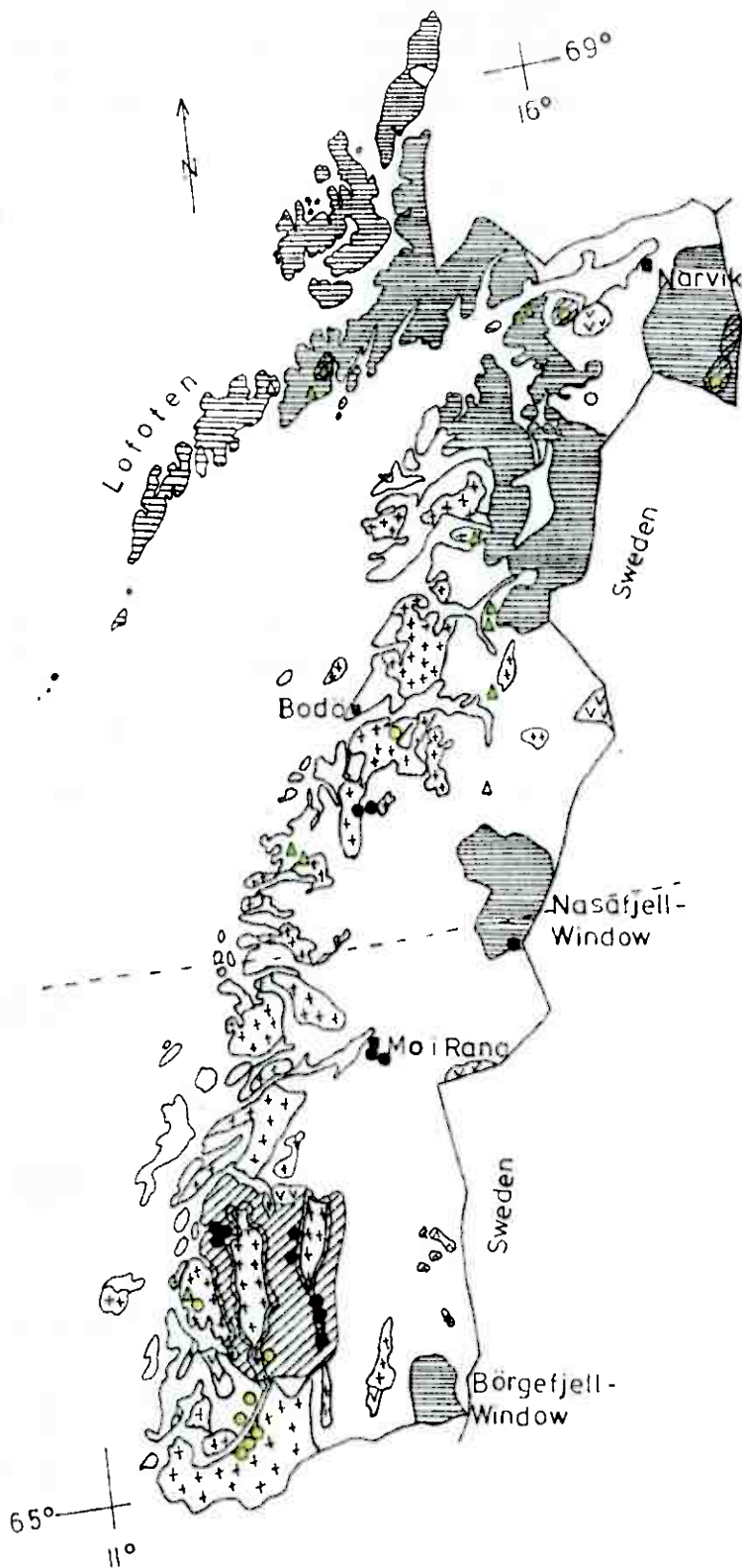
The Nordland fylke (county) is located between 65° and 69° lat. and 11° and 18° long. It forms a mountainous area along the coast of the Norwegian Sea. Despite its geographic position the climate is quite moderate due to the mild Gulf Stream. All harbours are ice-free. The main highway through Norway as well as the railway line from Trondheim to Bodö run through Nordland in south-north direction. Numerous paved and unpaved secondary roads cross the area. A few areas, however, are difficult to access by car. The airports of Evenes (near Narvik) and Bodö are serviced daily by jet flights from Oslo and Trondheim. Several smaller airports are present, scattered along the coast. The main service supply centers are Brønnöysund, Mo i Rana, Bodö, Narvik, and Svolvær.

3. Regional Geology of Nordland

Most of the outcrop area in Nordland is formed by the rocks of the Caledonian geosyncline that extends throughout the whole length of Norway. Another part is formed by the Precambrian basement that is exposed in the Lofoten area and in some windows within the Caledonian mountain system.

The Precambrian basement:

The outcrop area of the Precambrian basement can be found in the Lofoten area and in windows that are exposed along the border with Sweden. The most important ones are the Rombak, the Nasafjell, and the Börgefjell windows. The rocks of these windows were dated at



Regional Geology Map
of Nordland

-  Granitic Intrusives
-  Gabbro
-  Ultramafics
-  Caledonian Sediments
-  Precambrian Basement
-  Au/As
-  Ag (Pb, Zn)
-  Mo
-  Proposed Investigation Areas

0 50 100 km

about 1.7 b.y. They comprise mostly granites and gneisses. A part of these gneisses are probably of sedimentary origin. Around the windows quartzites are sometimes exposed as at the Borgefjell window and north of the Nasafjell window. Often these are covered by the Caledonian nappes that overlies directly the Precambrian basement.

Rocks of the Caledonian geosyncline:

The rocks of the Caledonian geosyncline, mostly dominated by meta-sediments, are comprised in three major nappe complexes:

- Upper Nappes (Helgelands Nappe Complex, Beiarn Nappe, Niingen Nappe)
- Rödingfjell Nappe
- Seve-Köli Nappe Complex

Seve-Köli Nappe Complex:

These rocks form the lowermost nappes. They can be found in the Hatfjelldal, Sulitjelma, and Ofoten areas. They comprise schists, and carbonate rocks. The rocks were dated to be of Ordovician age (about 470 m.y.).

Rödingfjell Nappe:

The rocks of this nappe have a wide outcrop area in Nordland. They consist mostly of thick micaschist units that alternate with marbles and other calcareous rocks. Rocks of volcanic origin are rare. Some rocks of this nappe were dated older than 570 m.y.

Upper Nappes:

These nappes comprise schists and marbles. They can be found in three different areas: The Helgeland Nappe Complex, the Beiarn Nappe, and the Niingen Nappe. Correlations between these nappes are difficult. All three are characterized by numerous granitic intrusions. The largest granitic intrusion inside the Caledonian mountain system can be found inside the Helgeland Nappe Complex: the Bindal granite. The Beiarn Nappe has quite large intrusions, too, whereas the intrusions in the Niingen Nappe, in Ofoten are more like veins. It is assumed that the granites intruded during the main deformation period and were formed by upmolten sediments.

The Bindal granite was dated at 424 m.y., so that the granites are younger than their host rocks. Some age determinations of the Bei-arn Nappe show that at least a part of the sedimentation took place more than 600 m.y. ago.

All the rocks of the Caledonian geosyncline were subjected to complex folding and regional metamorphism.

Nordland is, in comparison to other Norwegian counties, relatively rich in ore occurrences. At present three mines are in production: the Bleikvassli and the Mofjell mines, both mainly Pb and Zn producers and the Sulitjelma mine, Norway's largest copper producer.

Of special interest for future exploration are areas with occurrences of precious metals. A district with gold-quartz mineralization is located in southern Nordland, in the Bindal area, where the large granitic intrusives play an important role in ore formation. Other gold mineralizations are located in the Precambrian Rombak window and in the Håfjell syncline that is located within the Caledonian nappes in Ofoten. Silver rich Pb, Zn occurrences, partly also rich in gold, can be found in the Svenningdal area. Here the intrusive granites also seem to be of importance for the ore formation. More than 50 other Pb, Zn mineralizations occur throughout Nordland, partly rich in silver.

Occurrences of tungsten and molybdenum have been noted, too.

Numerous vein type sulfide mineralizations with chalcopyrite and/or sphalerite occur throughout Nordland. This type of mineralization seems to be of no interest for exploration at present.

Nordland is known for its numerous occurrences of iron ore.

4. Exploration Potential for

4.1 Gold

4.1.1 Bindal Area

In Nordland one can distinguish five different areas in which gold mineralizations occur. Several gold mineralizations are known in the Bindal area in the southern part of Nordland, in south Helgeland. The mineralizations are known since the last century and occur generally in quartz veins as stockworks in connection with arsenopyrite.

They are reported to be located within small mylonitized granitic bodies that are situated within the sediments that overlie the large Bindal granite intrusion. The sediments in this area consist mostly of micaschists and marbles. The most known occurrences are Reppen and Kolsvik that were investigated throughout this century by diamond drilling, tunneling, trenching, and sampling. At present A/S Sulfidmalm (Falconbridge) has a drilling program in this area. Data about the gold content vary considerably from 1 to 50 ppm, certainly due to the occurrence of coarse gold grains. The average content of the two named mineralized areas seems to be somewhere around 5 ppm Au. Scheelite has been noted in connection with the gold-bearing quartz veins. After the present available reports, however, the content seems to be low.

Undoubtedly the large Bindal granite intrusion plays an important role in the formation of the gold-quartz stockworks. As the mineralizations are predominantly hosted in the overlying sediments, or in minor granitic intrusives within the sediments, these areas around the granite have a potential for gold-quartz mineralization and are a good target for exploration. Indeed, further north of the Bindal area two gold-quartz mineralizations are known, one in quartzites near Godvassdalen, and one near Andalsshatten in connection with a diorite/gabbro/ultramafic complex. A stream sediment survey could be conducted covering the outcrop area of the marbles and micaschists that overlie the Bindal granite in its central part and at its margins. Good geological information is available about the northern part of the area whereas it is partly lacking in the southern part.

4.1.2 Skjerstad near Bodø

West of Skjerstad, near Bodø, some arsenopyrite-bearing quartz veins are described. One of these (at Utvik) is reported to be mineralized with gold. A sample that was taken in 1935 showed a content of 5 ppm Au. The occurrences are situated within a granite that is possibly one of these that intruded the Caledonian sediments (similar to the Bindal granite). The mineralizations were visited by the NGU in 1977 and were described as very small occurrences

without economic interest. Since 1935 no analysis for Au was conducted!

4.1.3 Håfjell Syncline in Ofoten

At the Ofotenfjord, northern Nordland, four gold mineralizations can be found within a large syncline, that closes in Håfjell. It consists of a thick sedimentary sequence. The mineralizations are located almost in the nose of the syncline structure within the so-called Bø- or Balteskar quartzite, close to Fuglevannene. They consist of arsenopyrite and smaller amounts of pyrite, pyrrhotite, chalcopyrite, and galena. Different analyses show contents between 1 and 18 ppm Au. Visible gold was not reported. The gold is possibly bound to the arsenopyrite. It is unclear if the mineralizations were formed by hydrothermal fluids, in which case the mineralizations would be of little economic interest, or if the gold is possibly alluvial. Microscopic investigations show that the galena mineralization seems to be younger than the arsenopyrite mineralization. In 1934 Orkla Gruveaksjebolag investigated the quartzite for its gold content. Some profiles of the quartzite were sampled over its outcrop zone. In many of the samples no gold was detected, some of them contained 1-1.5 ppm Au. In another report, however, a pure quartzite sample contained 11.25 ppm Au, whereas a sample of almost pure arsenopyrite contained only 3 ppm Au. Therefore it is unclear how the gold is bound to the quartzite.

A field inspection could give more information about the character of the mineralizations. If the gold would really be hosted as a fossile placer in the quartzite that would open up a quite large exploration potential with exploration targets in the outcrop area of this quartzite. The quartzite belongs to the Bogen group, is very uniform and mostly 30-40 m thick. It can be found not only on map sheet Ofoten but extends to the map sheets Narvik, Salangen, and Harstad. As the quartzite horizon is mapped quite in detail, some profiles with soils could be sampled over its outcrop area in the Håfjell syncline not far from the already known mineralizations. The analyses of the soil samples would show if the exploration concept is valid.

4.1.4 Rombak Window

The Rombak window is one of the larger Precambrian windows within the Caledonian mountain system. It is located close to the Swedish border. Most of the area is taken by the Rombak granite that is described as a coarse grained, grey microcline granite. Occasionally the colour is slightly reddish. The granite was dated at an age of 1.7 b.y. In addition to that, gabbros, mafic and acid volcanics, and sediments as conglomerates, quartz-biotite schists and limestones are present. The volcanics and the sediments are assumed to be older than the granite.

An arsenopyrite occurrence is described in the southern part of the window, southwest of the Kjörriřvann-lake. Only a few old reports exist about that mineralization, the newest dated in 1924. Data of analyses show contents of more than 25% As and more than 10 ppm Au. The mineralization is described to be at least 140 m long and more than 2 m thick. It is located at the contact of limestones with amphibolitic schists. The mineralization was investigated sometime between 1916 and 1924 by trenching and sampling but mining was only done on a very small scale. The main reason was probably the prohibition of ore exports during World War I. A report about the test-mining activities states that the ore is getting wider and better in quality towards the depth.

While this report was in preparation, claims were staked at this occurrence by Polldal Verk as well as in an area further to the northeast, very close to the Swedish border. In this area arsenopyrite mineralization was described, too, with gold contents up to 16 ppm. The geological environment is the same as on Kjörriřvann. Apart from the mineralizations the outcrop area of the limestones was staked with claims. Only a little north of the arsenopyrite occurrence an old copper prospect, Sjangelı, is located, also in connection with limestones. According to old reports the mineralization should contain minor amounts of gold, too. Claims are held at this occurrence by Sjangelı Norske A/S.

In an old report from 1924 a mineralized zone with arsenopyrite is described, starting from Kjörriřvann and extending over a length of more than 25 km through the Rombak window and finally ending north

of the described copper prospect Sjängeli. In some parts the mineralized zone is said to be several times larger and wider as the zone at Kjörriðsvann. Until now it was not possible to locate the mineralized zones exactly. Therefore the area should be investigated during the next summer season. The areas with the claims staked by Follidal Verk cover parts of this long zone.

The mineralized areas should be covered by ground geophysics (CEM shoot back, mag.) to outline drill targets. Probably soil geochemistry will be necessary. Detailed geological mapping should be conducted as well as ore sampling.

All over the world several deposits with arsenopyrite and gold in connection with limestones or dolomites are known such as the Beatrice Mine, Malakka (Malaysia), Reichenstein, Schlesien (East-Germany) and several deposits in the USSR. A large arsenopyrite deposit is located at Boliden, northern Sweden, where large amounts of gold and silver were produced. The deposit is located within the Precambrian basement that is about 1.7 b.y. old, the same age as the rocks of the Rombak window.

In the northern part of the Rombak window an arsenopyrite mineralization is located, named Beicagoppi, about 1.5 km north of Nedre Jernvann. No reports are available about this occurrence. It would be interesting to run some samples of this occurrence for gold.

Another occurrence, Katterat, is located in the northern part of the window. Several mineralizations are located around the Katteratvann-lake within granite, mafic volcanics, or sediments. In newer reports (NGU) the occurrences are described as Pb, Zn vein type mineralizations and as small without economic interest. Some occurrences are described to be mineralized with sulfides as pyrrhotite and very little arsenopyrite! None of the taken samples was analyzed for gold. On the ore registration map of northern Norway (NGU Nr 204, 1964) however, the Katterat occurrence is described as As, Au, Pb mineralization. No further informations are available about Katterat.

The NGU has reports about a stream sediment survey and an airborne helicopter survey over the Rombak window area that was conducted in 1981. Unfortunately the survey comprised only a magnetic and a

radiometric survey. The reports could be very useful for further estimation of exploration potential in the area.

The Rombak window seems to be a very interesting area for further exploration for possible gold deposits, especially interesting in the outcrop area of the volcanics and calcareous sediments. In this place it should be mentioned that another Precambrian window is located further north, in Troms, south of Dividalen, close to the Swedish border. Very little is known about the rocks that are mainly composed of granites and gneisses. No ore occurrences are indicated on the ore registration map. Possibly a correlation exists between these rocks and those of the Rombak window. In the very western part of Finnmarksvidda (Map sheet CIER'TE) occur similar rocks as in the Rombak window.

4.1.5 Buktedalen (Tysfjord)

Two reports from 1911 and 1913 describe a Cu, Au occurrence at Buktedalen, east of the Indre Tysfjord, in northern Nordland. The occurrence is located west of the Rombak window within the Caledonian nappes. A quartz vein that is situated within hornblende rich micaschists contains several copper minerals as bornite, chalcocite, and little chalcopyrite. The length of the vein is about 1 km. In one of the numerous quartz veins closeby, a sample with native gold was found. Some analyses of samples show gold contents between 2 and 9 ppm. The area is difficult to access.

Apart of the areas described above, another area was known for its occurrence of gold. At the Pb, Zn, Ag Svenningdal mine in southern Nordland gold was produced as a byproduct. This area will be discussed in chapter 4.2 Silver.

4.2 Silver

Silver mineralizations in Nordland are predominantly bound to Pb, Zn ores and can be found in five major districts:

4.2.1 Area around Svenningdal

The old silver rich Pb, Zn mines at Svenningdal are located in the centre of the area. The occurrences, Nedre and Övre Svenningdalen and

Jakob Knudsens grube, were mined from 1878 to 1899. The mining operations had to be finished due to the low silver prices at that time. About 4700 tons of ore concentrate were produced, containing 17700 kg silver and 37 kg gold. Recent estimations by NGU result in reserves of totally 1500 tons metallic Pb, Zn, and Cu. The mineralogy of the mines was investigated in 1967 in a thesis by a student of the University Mainz/Germany. The silver is bound to tetrahedrite for a large part, another part to the galena and several silver minerals. Native gold was described, too. The ore occurrence is a typical vein type occurrence with east-west striking crack fillings that cross several geological units. It is located within marbles and calcareous schists at the eastern margin of the Reinsfjell granite. The granite was described by former investigators as intrusive. Some recent investigators, however, doubt that and assume that the granitic body is a granitic gneiss of sedimentary origin as it exhibits some clear sedimentary features. Whatever the origin of the Reinsfjell granite may be, it seems to have a decisive influence on the ore formation, not only for the Svenningdal mines, but also for other Pb, Zn occurrences that are located close to its margins.

Several Pb, Zn mineralizations are located in the vicinity of Svenningdal which are impregnations within marbles, calc-silicate rocks, or gneisses parallel to their strike direction. As mentioned above, they are located close to the contact with the granite.

Eiterådal, a mineralization of this type, is located 5 km southwest of the Svenningdal mines, on the west side of the granite, situated within marbles and schists. The ore zone is about 60-80 m long and 2-3 m thick. The grade is about 1.9% Pb, less than 1% Zn and about 150 ppm Ag. Further south, another Pb, Zn mineralization, Övre Hjortskarmo, can be found. No information about this occurrence is available.

About 20 km north of Svenningdal the Pb, Zn mineralization Ravnåsen is located. It is also situated within marbles, west of the Reinsfjell granite and can be followed over a total length of 2 km. The mineralization was investigated by NGU by geophysics, soil geochemistry, and diamond drilling. A stream sediment survey had been conducted by Sydvaranger in 1972 between Eiterådal and Ravnåsen. NGU came to the conclusion that the mineralization is not economic. The

average ore grade is about 1-2% Zn and 0.5% Pb with low Ag. Au was not analyzed. Scheelite has been mentioned in connection with this occurrence.

Husvik, another major Pb, Zn occurrence, is located about 45 km southwest of Svenningdal. The mineralization is located within marbles and calcareous schists in close association with the Bindal granite. The NGU estimated the reserves at 35000 tons metallic Pb, Zn, and Cu together. Husvik consists of several separated mineralizations. It is interesting to note that the occurrence is mineralized with arsenopyrite. The ore grade is about 20% Zn, 10% Pb, and 100 ppm Ag. Au was apparently not analyzed. The occurrence has been investigated by several geologists, mainly from NGU.

Apart from the mineralization described above, several other smaller mineralizations can be found as Sördal, Skamnesfjell, Forshaugen (with arsenopyrite), and Brennåsen that are situated in the same geological environment.

The Pb,Zn,Ag,(Au) mineralizations described above occur all in a distinct geological environment - in calcareous sediments close to the contact with granites that probably represent intrusives. The situation is very similar to that of the gold mineralizations in the Bindal area. Therefore potential for gold mineralization is also in the outcrop area of the sediments around the Reinfjell granite. Gold analyses of the known mineralizations are apparently not present. The proposed stream sediment survey in the Bindal area could be combined with one in the Svenningdal area as the areas lie geographically close to each other. The outcrop area of the sediments between the Bindal granite and the Reinfjell granite, north of the Bindal granite, and the eastern margin of the Reinfjell granite could be covered by a stream sediment survey in the search for Au and Ag(Pb,Zn,Au) mineralization.

4.2.2 Mofjell Area

Two mineralizations in the vicinity of the Mofjell mine were reported to be silver-bearing. The Mofjell mine, owned by A/S Sydvaranger is one of the two Pb,Zn mines that are under production in Nordland at present. The ore was mined since 1928, and until 1974 2.4 mm tons of ore were produced. The reserves are about 1.8

mm tons. The average ore grade is about 3-4% Zn and 1% Pb. The ore zone is located within amphibolites close to the border with a gneiss-amphibolite series and comprises three different lenses. The two mineralizations that are reported to be silver rich are Tretthammeren and Sölvgruve, both smaller mineralizations.

4.2.3 Nasafjell Area

The area belongs to the Nasafjell window, one of the larger Precambrian windows that are exposed within the Caledonian mountain chain. The mineralized area is located very close to the border with Sweden. The rock types within the window are predominantly granites and gneisses. The gneisses in the northern part of the window are dated at an age of 1.78 b.y. The mineralization occurs within a zone of quartzite and graphitic schists. On the Swedish side an old mine is located within a lense of hydrothermal quartz. The ore consists of pyrrhotite, sphalerite, and galena, with minor amounts of chalcopyrite, pyrite, boulangerite, arsenopyrite, and stibnite. The galena contains about 0.15-0.2% Ag. Au analyses are not reported. On the Norwegian side the mineralization is reported to be very small. Both ores on either side of the borders are of the same type.

4.2.4 Beiarn Area

Two Pb,Zn mineralizations, Nonsfjellet and Vassheia, were reported as silver rich occurrences in the Beiarn kommune, south of Bodö. The occurrences are situated within schists that contain thin marble layers. Both mineralizations are of the same type. The mineralized zones consist of a few bands that are in general up to 10 cm thick but can get also up to 50 cm thick. The length varies between 50 and 100 m. Predominantly sphalerite and galena can be found. Pyrrhotite is common. Beside these, 4-5 other minerals of minor importance are reported. The galena is reported to contain 0.2-0.5% Ag and relatively much Sb. Au analyses are not present. NGU estimated the reserves as small.

4.2.5 Mikkelfjord/Hatfjelldal

The Mikkelfjord occurrence is located in the Hatfjelldal area, east of Svenningdal, within the rocks of the Seve-Köli nappe. Mostly carbonate rocks are present but some rocks of possibly volcanic origin, too. The ore occurs within small quartz veins that are located within calcareous schists. The reserves are small, probably 300 tons of ore. The average ore grade is about 3% Zn, 2% Pb, 0.1% Cu, 4% As, 0.4% Sb, and 30 ppm Ag. Au analyses are again not present. The mineralogy is similar to that at Svenningdal. The area east of Mikkelfjord was investigated by NGU by a stream sediment survey without the detection of new mineralizations. In 1981 A/S Sydvaranger had an airborne helicopter survey in Hatfjelldal kommune that probably covered this occurrence.

4.3 Molybdenum

Several molybdenum occurrences are known in Nordland. Some of them have been subject to small scale production mainly during the war time. They are mostly associated with granites, often within pegmatites. Except on one, very little investigations were conducted at this type of mineralization. Most available reports are from the beginning to the middle of this century. A short description of the different occurrences is given after their geographical location from south to north:

4.3.1 Andalsvatten (Brønnøysund kommune)

The occurrence is situated in a mafic/ultramafic complex that is located within a granite complex. The molybdenite occurs within 1-5 cm thick veins together with tourmaline. The occurrence is very small.

4.3.2 Laksådal/Oterstrand (Gildeskål/Meløy kommune)

Several different occurrences of molybdenite are located in this area. In the southern part the occurrences of Lysvann and Övre Glomvann can be found. Impregnations of molybdenite can be found

in a granite that is of Precambrian age. The mineralizations occur close to the contact with the overlying sediments. The larger occurrences in this area are those of Laksådal and Oterstrand. Both occurrences have been subject to mining activities during World War I and finished in 1920. The mining operations then started again in 1937 and were finished in 1944. 13206 tons of ore were produced at the Laksådal mine and 22770 tons at the Oterstrand mine that was in production only for two years in the beginning of World War II. The average ore grade at the Laksådal mine was 0.25% MoS_2 . The mined mineralizations are larger pegmatite lenses but ore impregnation in the host rocks was reported, too. The area around the old mines was investigated by geochemical and geophysical surveys by British Oxygen Minerals, London, in the beginning of the 1970ies. Later the area was investigated by NGU with different surveys. An IP survey gave very promising results, especially north and west of Laksådalvann, indicating larger disseminated mineralization to the depth. Higher concentrations of uranium were found, too. The recent results of the investigations are not known. The Norwegian state owns claims on these mineralizations. North of the Laksådal/Oterstrand mines two other small mineralizations are located: Gilset and Opsal.

4.3.3 Leirjordfall/Tjaerdalskampan (Saltdal kommune)

The occurrence is located on the east side of a larger granite complex. In 1884 mining was started here. Two small mines, 400 m apart, are reported. During a period of two years 10 tons of molybdenite were produced.

4.3.4 Risatind/Rishaugfjellet (Fauske kommune)

Crack fillings with molybdenite occur in a contact zone of a granite with micaschists. Mineralization can be found over a length of 700 m along the contact with a very irregular content of molybdenite. The zone is in no place thicker than 1.5 m.

North of Rishaugfjellet, at Harelifjellet (Sørfold kommune) another Mo-trench is located. Uranium is reported from this occurrence, too.

4.3.5 Solskinnsbak (Sörfold kommune)

About 2.5 km north of Solskinnsbak, close to Nordfjord, some Mo occurrences can be found that are similar to that at Rishaugfjellet. Molybdenite occurs along the contact zone of granite with micaschists within quartz veins. The veins are up to 60 cm wide.

4.3.6 Kalvik/Rismålsheia (Sörfold kommune)

An occurrence of molybdenite within a pegmatite is located on the western slope of the Kalvituvas. The pegmatite is located within micaschists, apparently close to the contact with a granite.

- Four other Mo occurrences about which very little information is available. These are: Håkjaerringnes (Sörfold kommune), Nordfjell, Lillevåg, and Langvåg (Ballangen kommune).

4.3.7 Vatterfjord (Helle) Mine (Vågan kommune/Lofoten)

This occurrence seems to be best suitable for further exploration, as it seems to have a fair size and was not investigated during the last decades.

The occurrence is located at the Östnesfjord north of Svolvær, close to the farm Helle. The mineralization is located within a syenite that has the form of a north-south striking band and is surrounded by a fine grained granite. The rocks are Precambrian in age. Molybdenite occurs within the syenite in small veins, sometimes in coarse aggregates within pegmatitic veins, too. The length of the numerous smaller veins extends rarely 2-4 m. Mining was started in 1913 both in open pit and underground. Mining was finished in 1918. During this period of time 8962 kg ore concentrate with 80-90% MoS₂ and 231 kg with 95% MoS₂ were produced. Data about the average grade are not available. The ore was probably mined from more pegmatitic zones within the syenite. Disseminated mineralization over a larger area within the granite is reported. Therefore the mineralization is interesting as a possible exploration target. The location should be visited to get a better idea of the size and the type of mineralization. At present one claim is held on the old mines by a private person.

- Apart from the mineralizations described above an occurrence near Kabelvåg (Vågan kommune) is mentioned in an older report, as well as Sundklak (Vestvågøy kommune). No information was available about these occurrences.

5. Land Status and Competitor Activity

Folldal Verk staked several claims in two claim groups near Kjörrišvann in the southern part of the Rombak window to cover an area with Au,As mineralization. In addition to that claims were staked further to the northeast, south of the copper prospect Sjangeli that lies probably in the same stratigraphic horizon as the occurrence at Kjörrišvann. The staked claims cover the outcrop area of the here occurring limestones. From this area arsenopyrite mineralizations are reported with Au contents of 16 ppm. On the copper prospect Sjangeli itself, several claims are staked by Sjangeli Norske A/S (probably a private person). The USB (Norwegian state) staked 52 claims in one claim group only little further north of the occurrence at Kjörrišvann. The claims cover a minor belt of mafic volcanics and quartz biotite schists. Possibly USB is concentrated in the search for uranium as the NGU conducted an airborne helicopter survey for USB in 1981 in this area that comprised a magnetic and a radiometric survey. In the northern part of the Rombak window claims are held by a private person on the Beicasgoppi arsenopyrite occurrence.

At present apparently no claims are held on the gold mineralizations in the Håfjell syncline.

At present A/S Sulfidmalm (Falconbridge) has a larger drilling program on the gold-quartz mineralizations in the Bindal area. Several claims are held by Sulfidmalm and the Norwegian State, which lent claims to Sulfidmalm.

In the Svenningdal area several claims are held by Sulfidmalm and one claim by a private person as on the old Svernindal- and Eiterådal mines.

In the area east of Svenningdal, in Hatfjelldal, A/S Sydvaranger conducted an airborne helicopter survey (operator NGU) in 1981. At present the investigations are probably in the follow-up stage. The Norwegian State owns 12 claims on the old Pb,Zn,Ag,As,Sb Mikkelfjord prospect that were lent to Sydvaranger for a period of 5 years.

Claims over a large area are staked in the Mofjell area by Bergverkselskap Nord Norge A/S (Sydvaranger) that is the operator of the Mofjell mine.

No claims are held at the Skjerstad arsenopyrite mineralizations at present.

Bleikvassli Gruber A/S owns three claims on the Nasafjell Pb,Zn,Ag occurrences.

At present no claims are held on the Pb,Zn,Ag mineralizations in the Beiarn area.

On the old Vatterfjord (Helle) molybdenum mine on Lofoten one claim is held by a private person.

Apart from the companies mentioned above, BP Norway has an exploration program in Nordland. Arco Norway announced to conduct mineral exploration programs in Norway. It is not known if they will run a program in Nordland.

6. Summary of Proposed Investigations

- Rombak Window:

Grids should be established over the by Follidal Verk claimed area with known Au,As mineralization with subsequent geological mapping and ground geophysics (CEM shoot back, Mag.) to outline drill targets. Eventually soil sampling will be necessary, too. Between Kjörriavann and Sjangeli, the zone that is mineralized according to the old report, should be mapped geologically (at least prospecting). NGU's reports of the airborne helicopter survey and the geochemical stream sediment survey could indicate further interesting areas. Possibilities for other exploration targets should be investigated within the window, especially in the northern part at the other arsenopyrite and

copper mineralizations. This would include sampling at the old prospects and assaying the samples for gold. These works in the Rombak window should be conducted on a higher priority basis in comparison to the other areas proposed.

- Håfjell Syncline:

The known Au,As occurrences should be visited to get a better idea about the type of mineralization. Some profiles with soil samples should be taken over the outcrop zone of the mineralized quartzite, close to the known mineralizations.

- Bindal-Svennindal Area:

A stream sediment survey could be conducted in the search for Au,Ag mineralization in the area between the Bindal- and the Rein-fjell granite.

Dette tilligger
til Nordland-rapporten
Hilsen
Michael Hansen

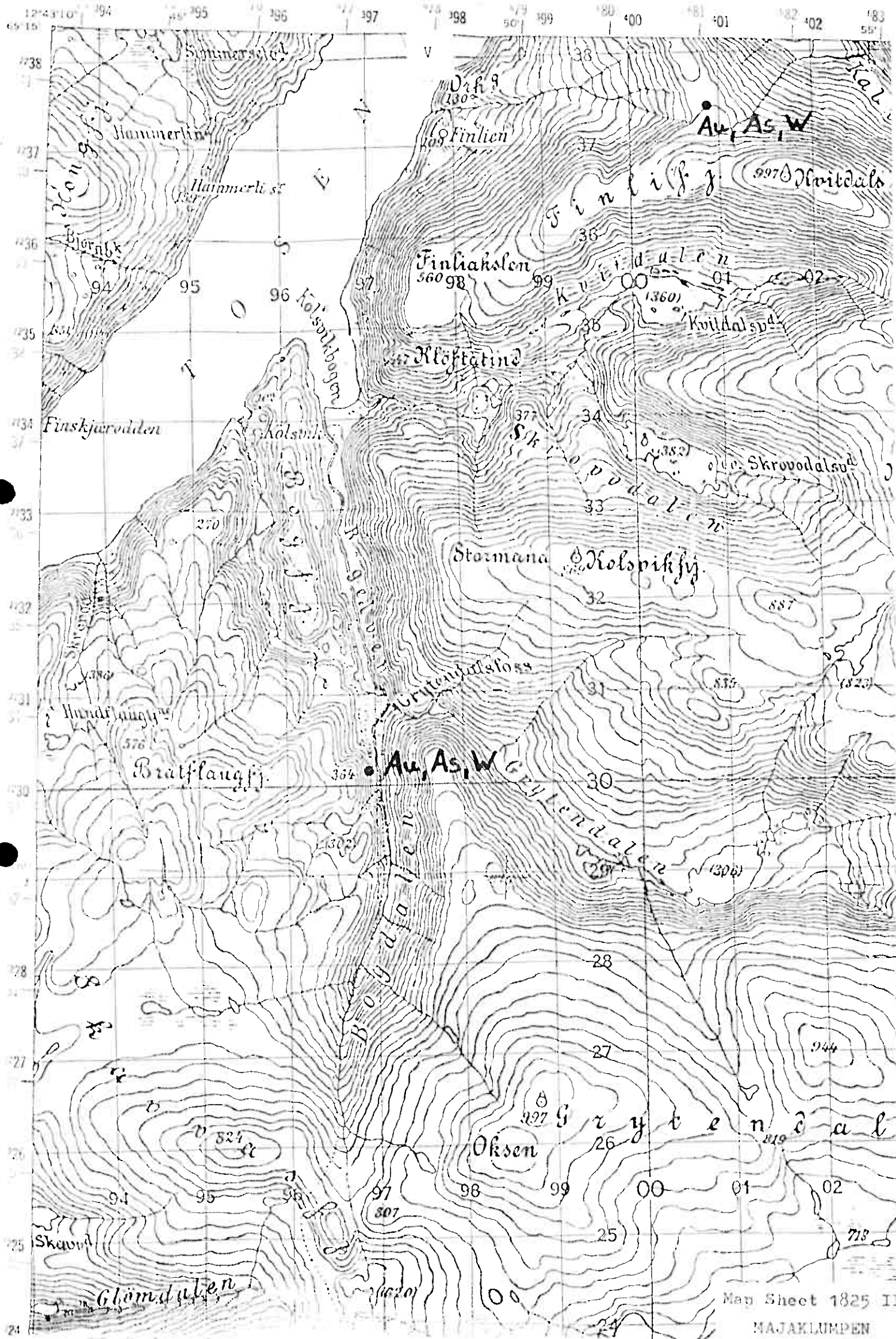
APPENDIX

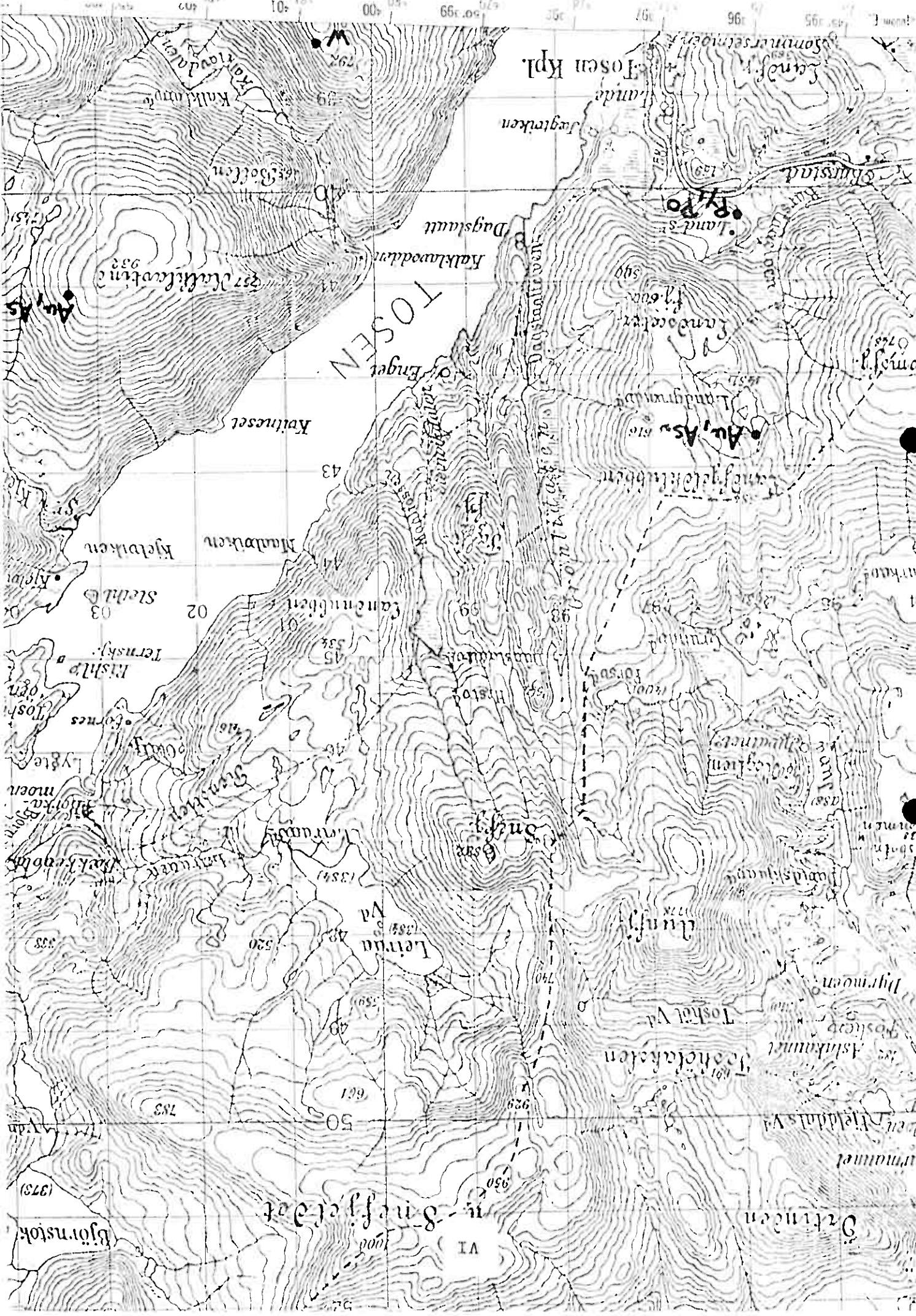
Locations of mineralizations:

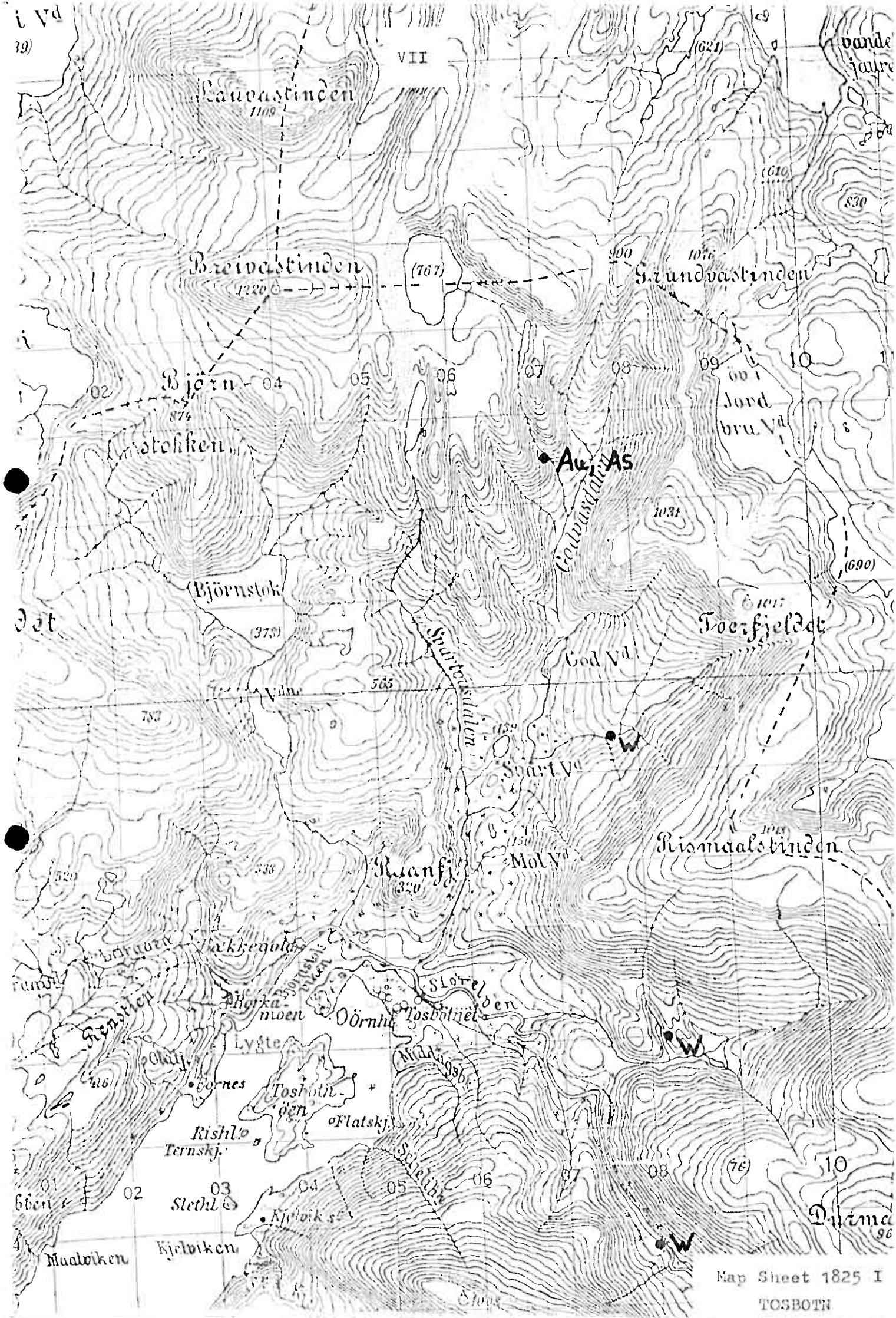
	Page
1. Bindal Area	
Reppenfjell (Au, As)	IV
Søbergslia (Au, As)	IV
Kolsvik (Au, As, W)	V
Finlifjell (Au, As, W)	V
Kalklavtind (Au, As)	VI
Landgrunnvann (Au, As)	VI
Barstad (Py, Po)	VI
Røskattdalen (W)	VI
Godvassdalen (Au, As); (W)	VII
Tosdalen (W)	VII
Krommen (W)	VII
Andalshatten (Au); (Mo)	VIII
Elvebakken (Sb)	IX
2. Skjerstad	
Utvik (Au, As)	X
Sandnesvann (As)	X
Sandnesheia (As)	X
Skjerstad (As)	X
Bøyren (Cu)	X
3. Håfjell	
Håfjell I-IV (Au, As)	XI
4. Rombak Window	
Kjörriisfjell (Gautelisfjell) (Au, As)	XII
Kjörriisvann (As)	XII
Nuorjojokka (Cu, As?)	XII
Possible zone with arsenopyrite mineralization (after O. Johnsen, 1924)	XII XIII XIV XV
Vavrat (Au, As)	XIV
Ruvssot (Sjangeli) (Cu)	XIV
Katterat (Pb, Zn)	XVI
Beicagoppi (As)	XVII

	Page
5. Buktedalen (Cu, Au)	XVIII
6. Svenningdal Area	
Svenningdal Mines (Pb, Zn, Ag, Au)	XIX
Eiterådal (Pb, Zn, Ag)	XIX
Brennåsen (Pb, Zn, Ag)	XX
Ravnåsen (Pb, Zn, (Ag), W)	XX
Øvre Hjortskarmo (Pb, Zn, Ag?)	XXI
Husvik (Pb, Zn, Cu, As, Ag)	XXII
Sördal (Pb, Zn, Ag)	XXII
Skarnesfjell (Pb, Zn, Ag)	XXII
7. Mofjell Area	
Mofjell Mine (Pb, Zn)	XXIII
Tretthammeren (Pb, Zn, Ag)	XXIV
Sølvgruve (Pb, Zn, Ag)	XXIV
8. Nasafjell (Pb, Zn, Ag, Cu, As)	XXV
9. Belarn Area	
Nonsfjellet (Pb, Zn, Ag, Sb)	XXVI
Vassheia (Pb, Zn, Ag, Sb)	XXVI
10. Mikkelfjord (Pb, Zn, As, Sb, Cu, Ag)	XXVII
11. Mo - occurrences	
Laksådal (Mo, U)	XXVIII
Oterstrand (Mo)	XXVIII
Øvre Glomvann (Mo)	XXVIII
Gilset (Mo)	XXVIII
Opsal (Mo)	XXVIII
Leirjordfall/Tjaerdalskampen (Mo)	XXIX
Risatind/Rishaugfjellet (Mo)	XXX
Harelifjellet (Mo, U)	XXX
Kalvik/ Rismålsheia (Mo)	XXXI
Håkjerringnes (Mo)	XXXII
Nordfjell (Mo)	XXXIII
Lillevåg, Langvåg	XXXIV

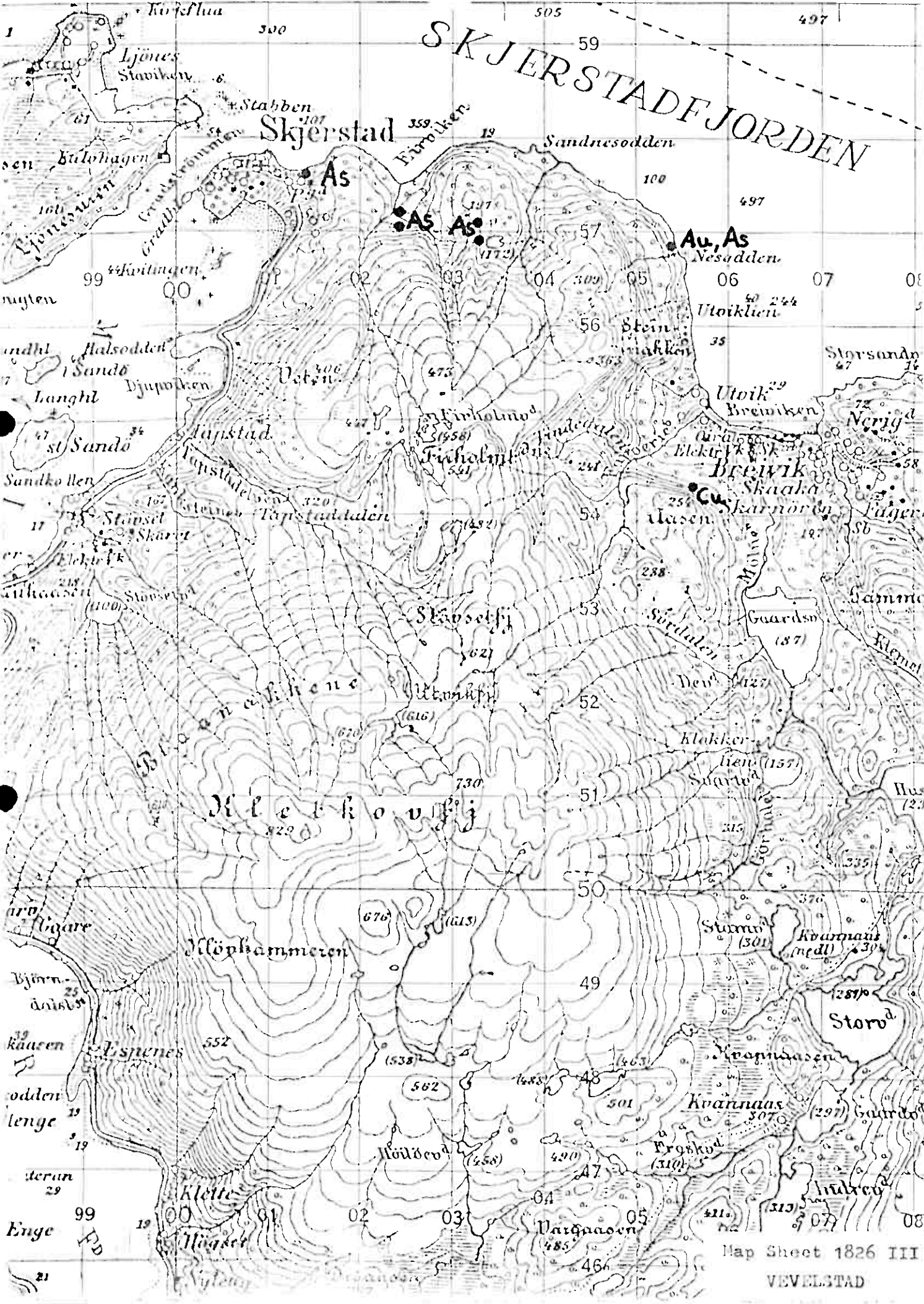
	Page
Vatterfjord (Helle) (Mo)	XXXV
Kabelvåg (Mo) (Vågan)	XXXVI
Sundklak (Mo)	XXXVII







8 499 15'00" 501 502 X 05' 504 505 506 507 10" 508



verrifjellet

Durmøls-
tinden

XII

Unnariepasvarre

HOLMEN

Ippovarre

Kobb-
vatnet

Jaralselva
8

ned

• As

• Cu

Kjerisvatnet

• Cu, As?

• Au, As

• Cu

Gautelisfjellet

• Cu

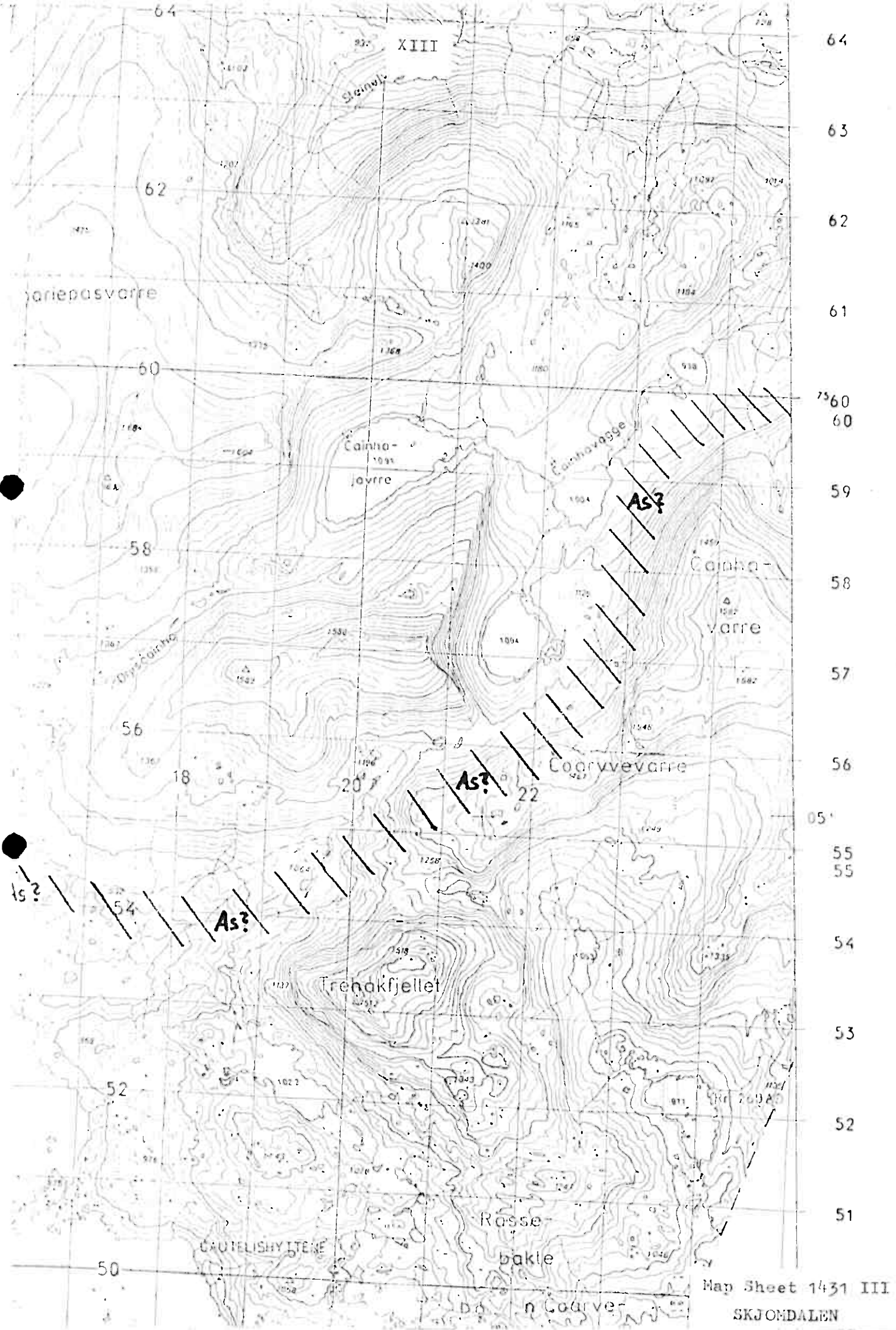
Rr 257 V. Jovaskjær

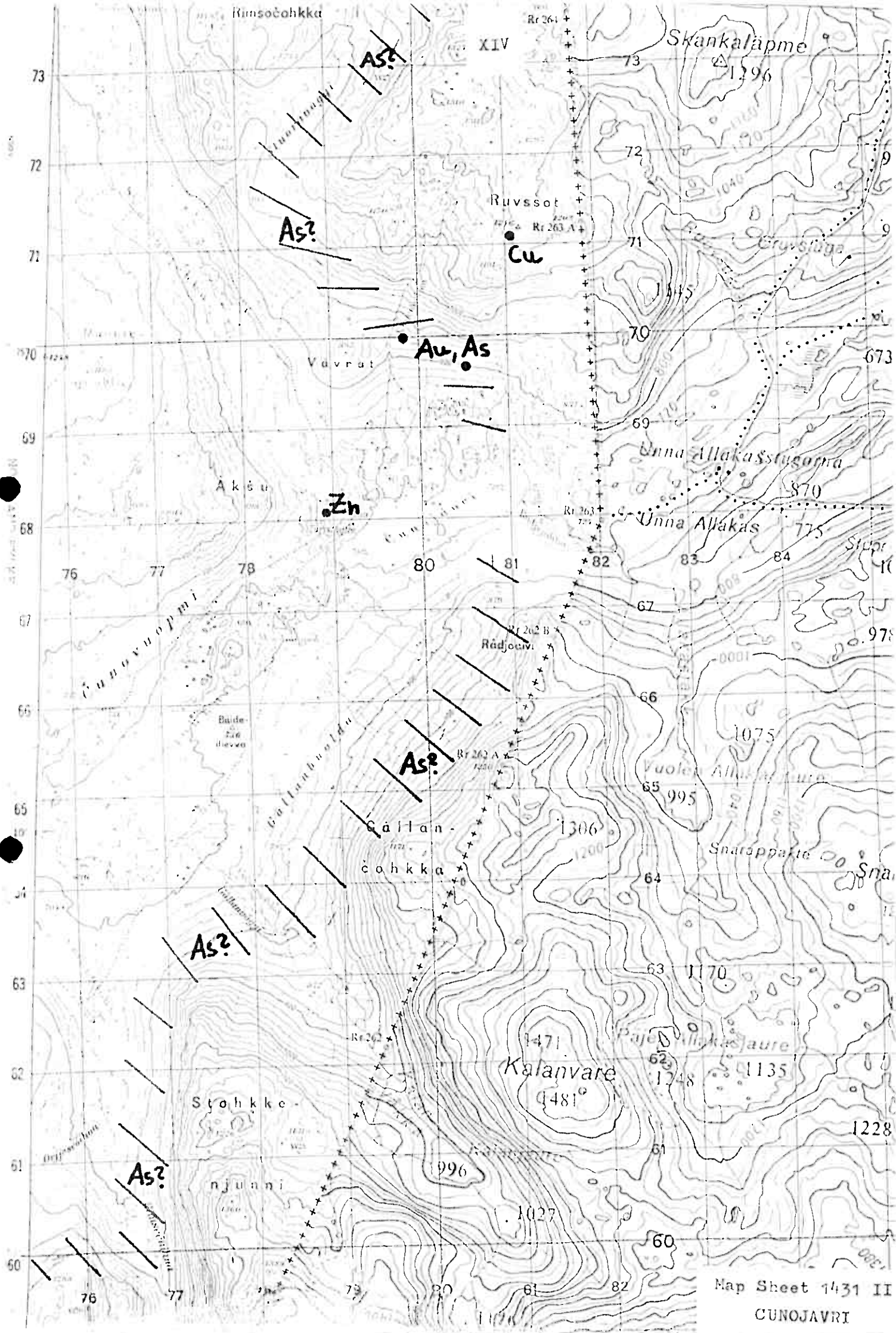
Gautelisvatnet

Rr 257A

Map Sheet 1431 III

SKJONDALEN

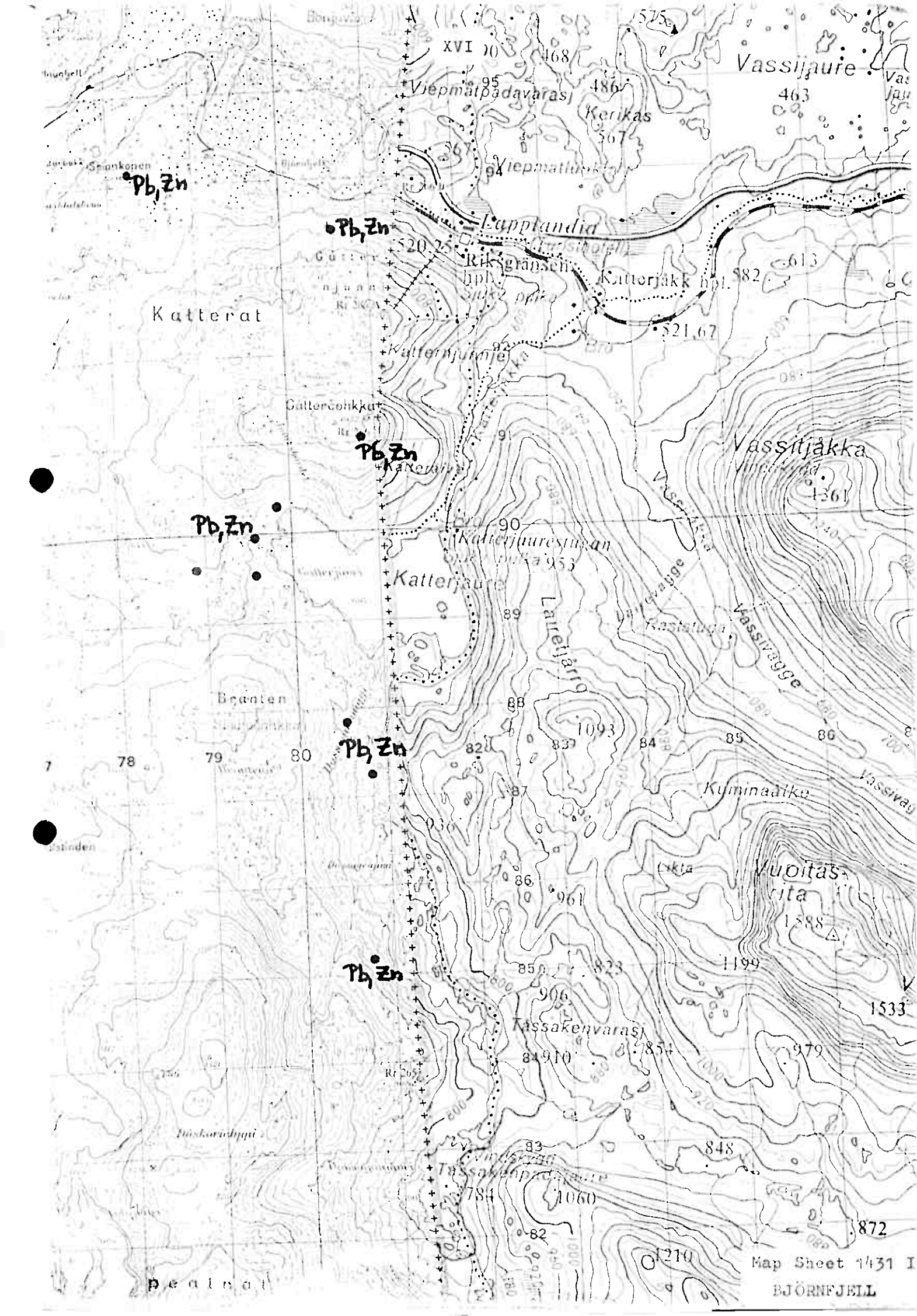




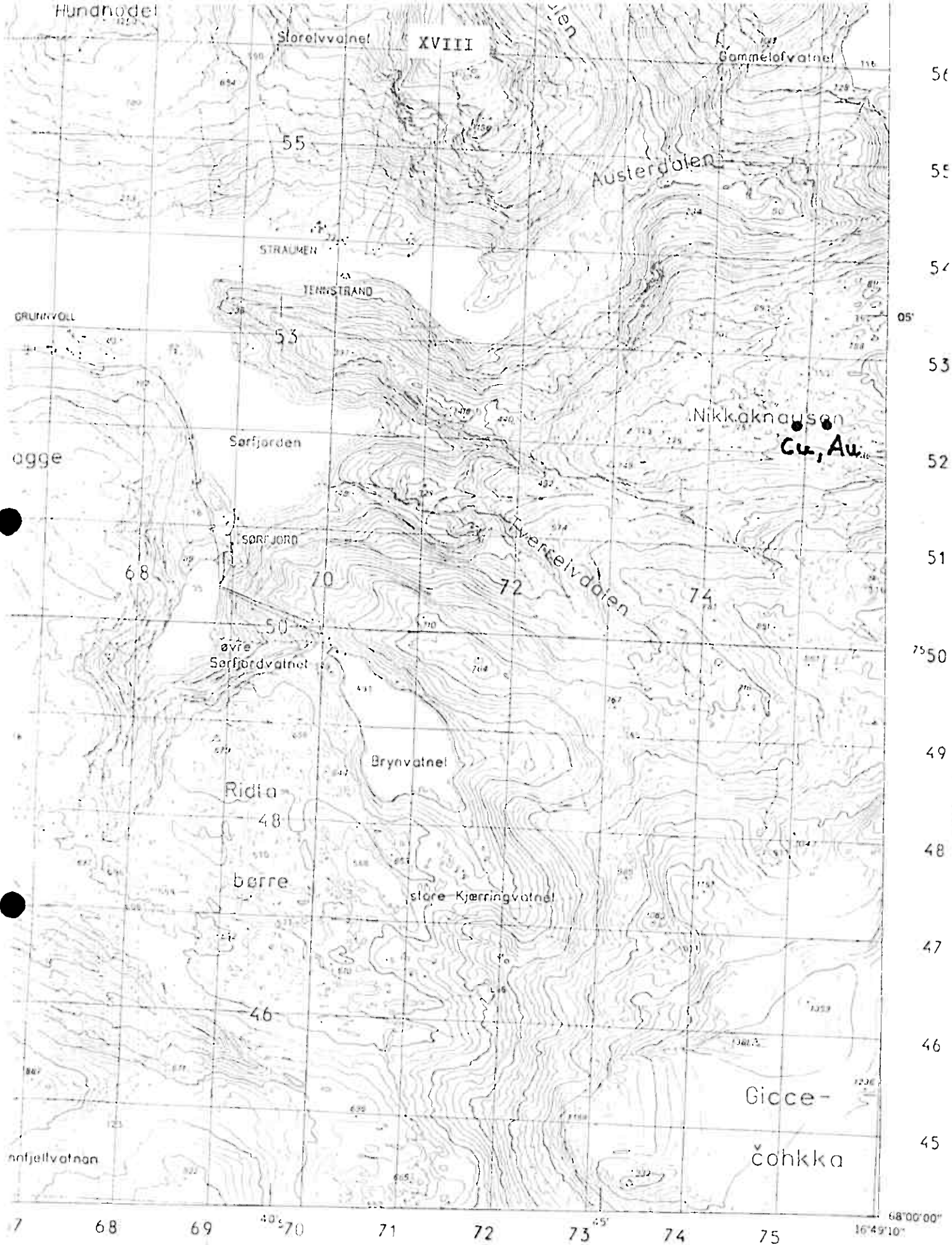


Map Sheet 1431 I

BJÖRNFJELL







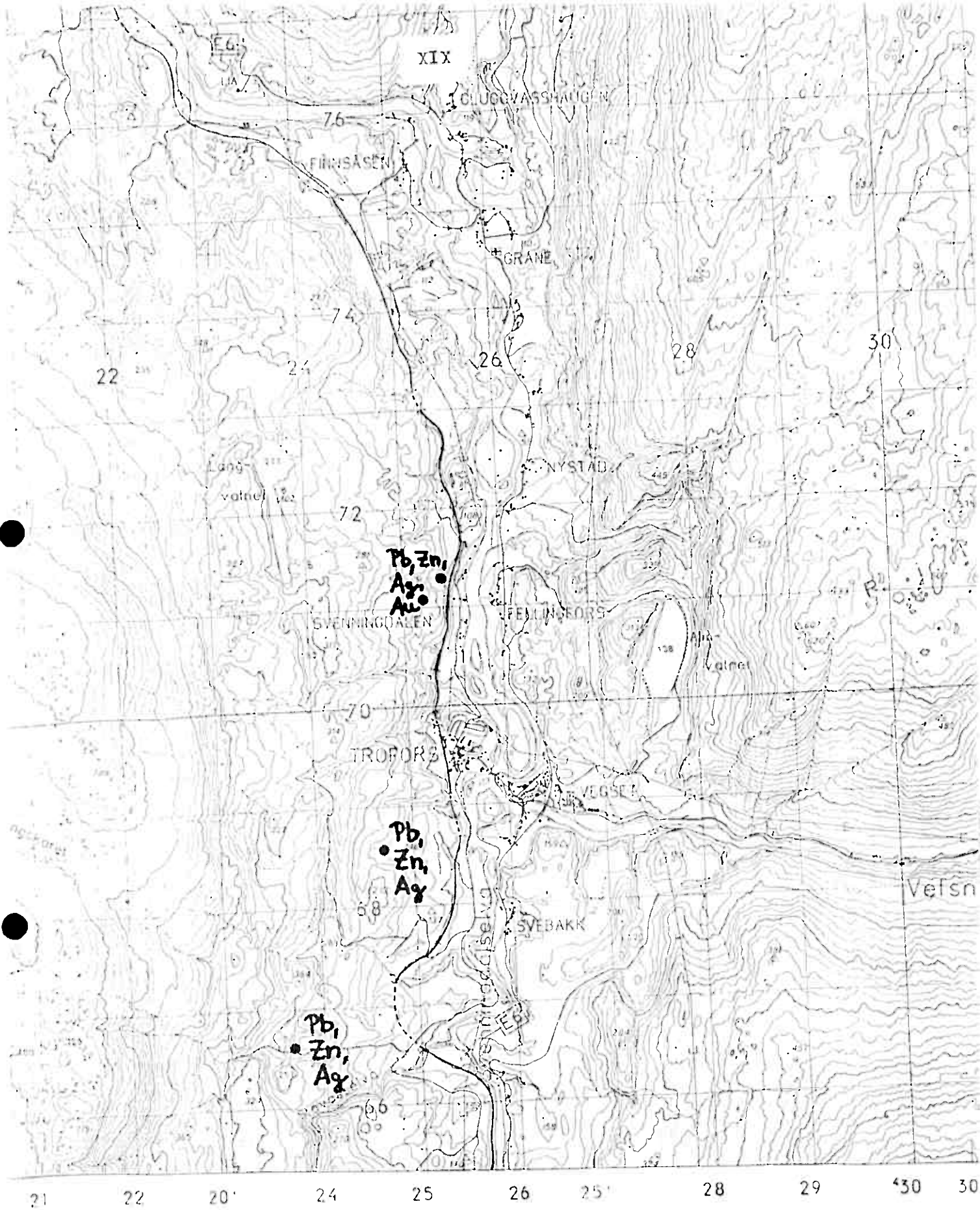
eters
Miles
3 Nautical Miles

TRYKTT NORGES GEOGRAFISKE OPPMÅLING 1-82
ETTERTRYKK ULOVLIG. NGO HAR ALL RETT EFTER LOV OM ÅRDSVERK

MAGNETISK ÅRSD
MAGNETIC NORTH
1955-11-20 (MILS)

Map Sheet 1331 III

TYSFJORD



ert 1977
side kartsteking

photography from 1977
taken from existing

no specifications.

Målestokk, Scale 1:50 000

1 500 0 1000 2000 3000

1 500 0 1000 2000 3000

EKVIDISTANSE 20 METER

Tellekurver 100 m

Mellomkurver 10 m

Høgt i meter over gjennomsnitts sjønivå

Djupa i meter under springnivå

EUROPEISK DATUM

KONFORM SYLINDERPROJEKSJ

Tal i SVART for rutelinje i UTM-s

CONTOUR INTE

Index contour

Supplementary c

Vertical Datum

Map Sheet 1926 III

GRANE

5° 45' 00"

13° 15' 10"

20'

93

92

91

90

89

88

87

86

85

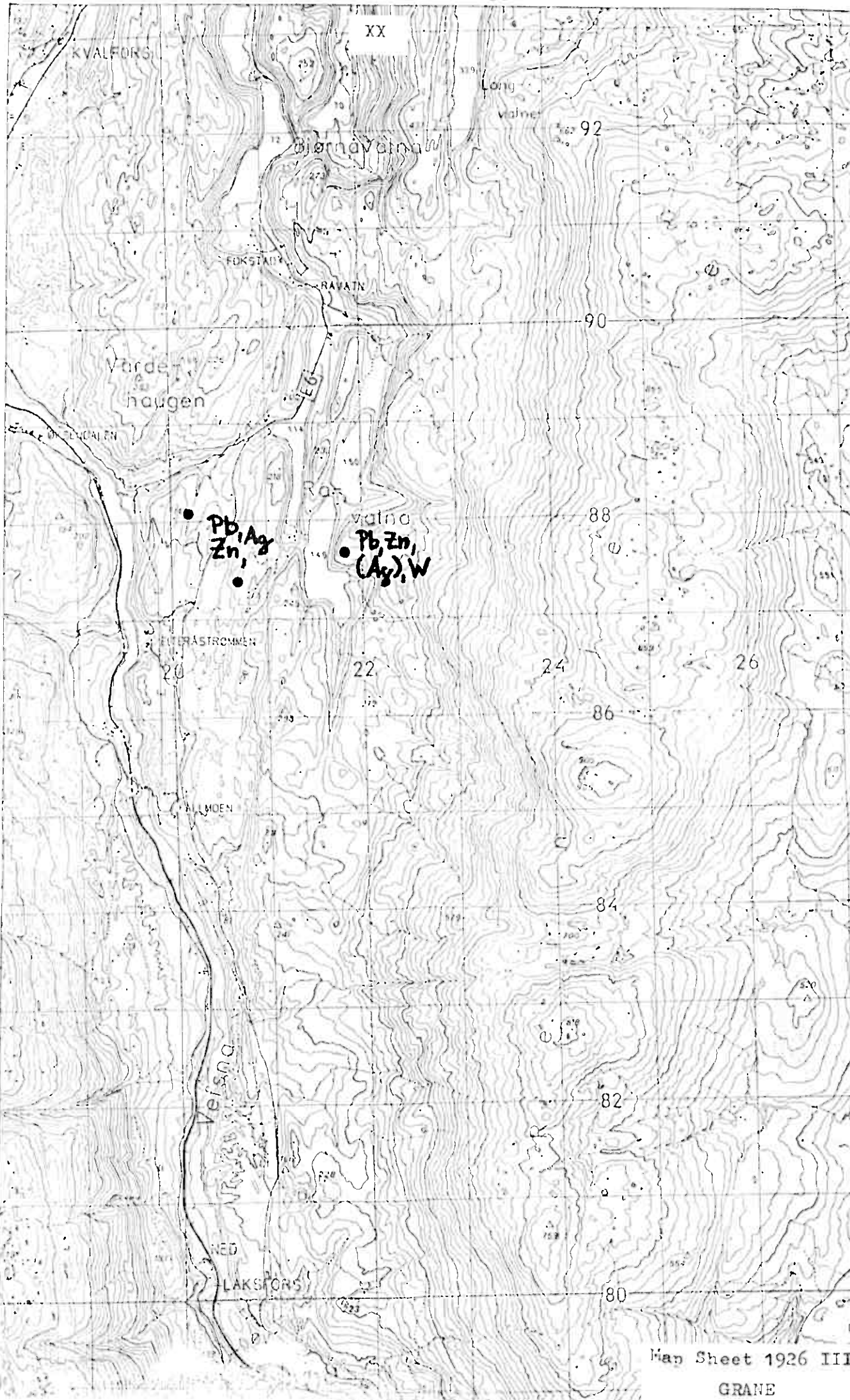
84

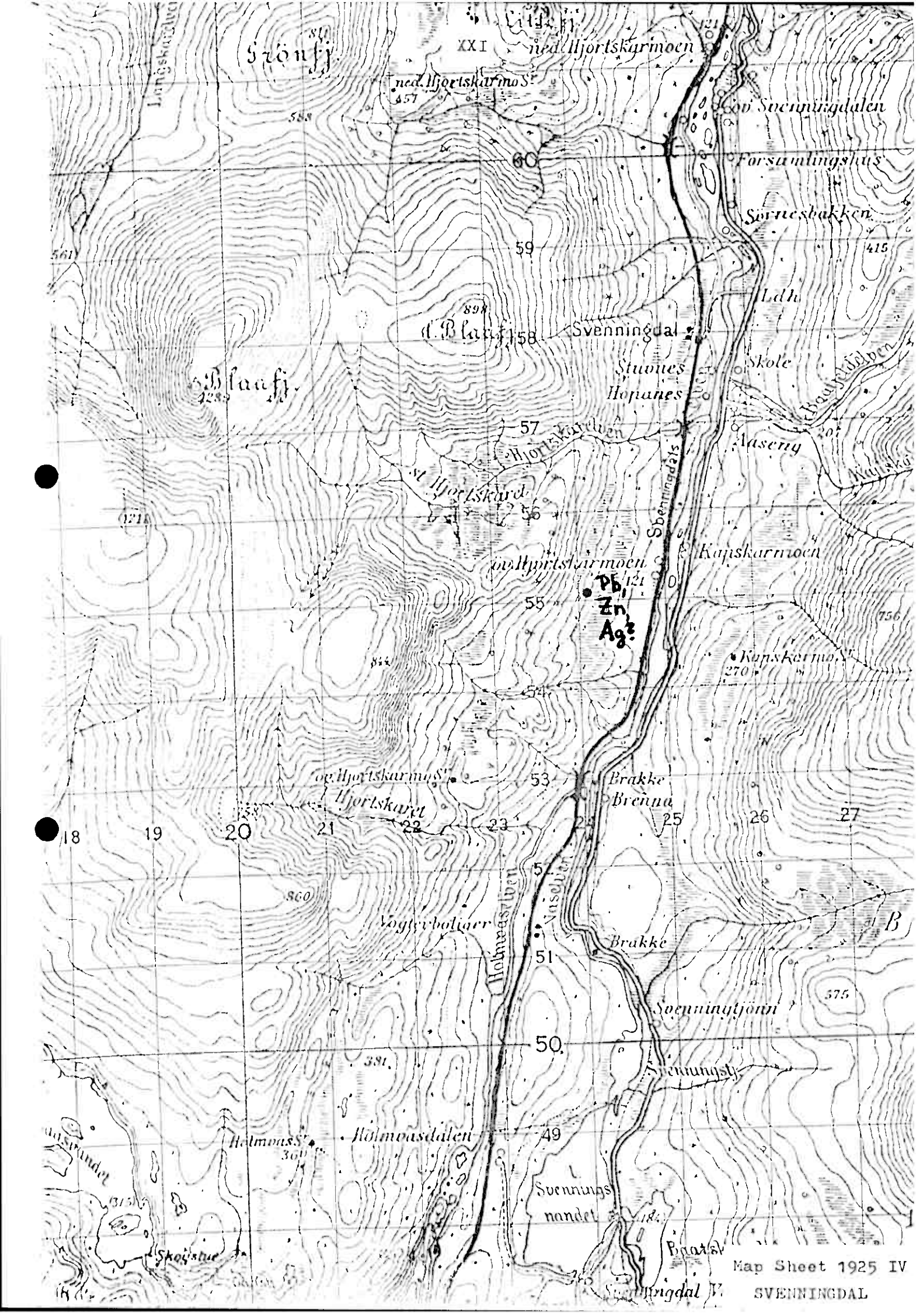
83

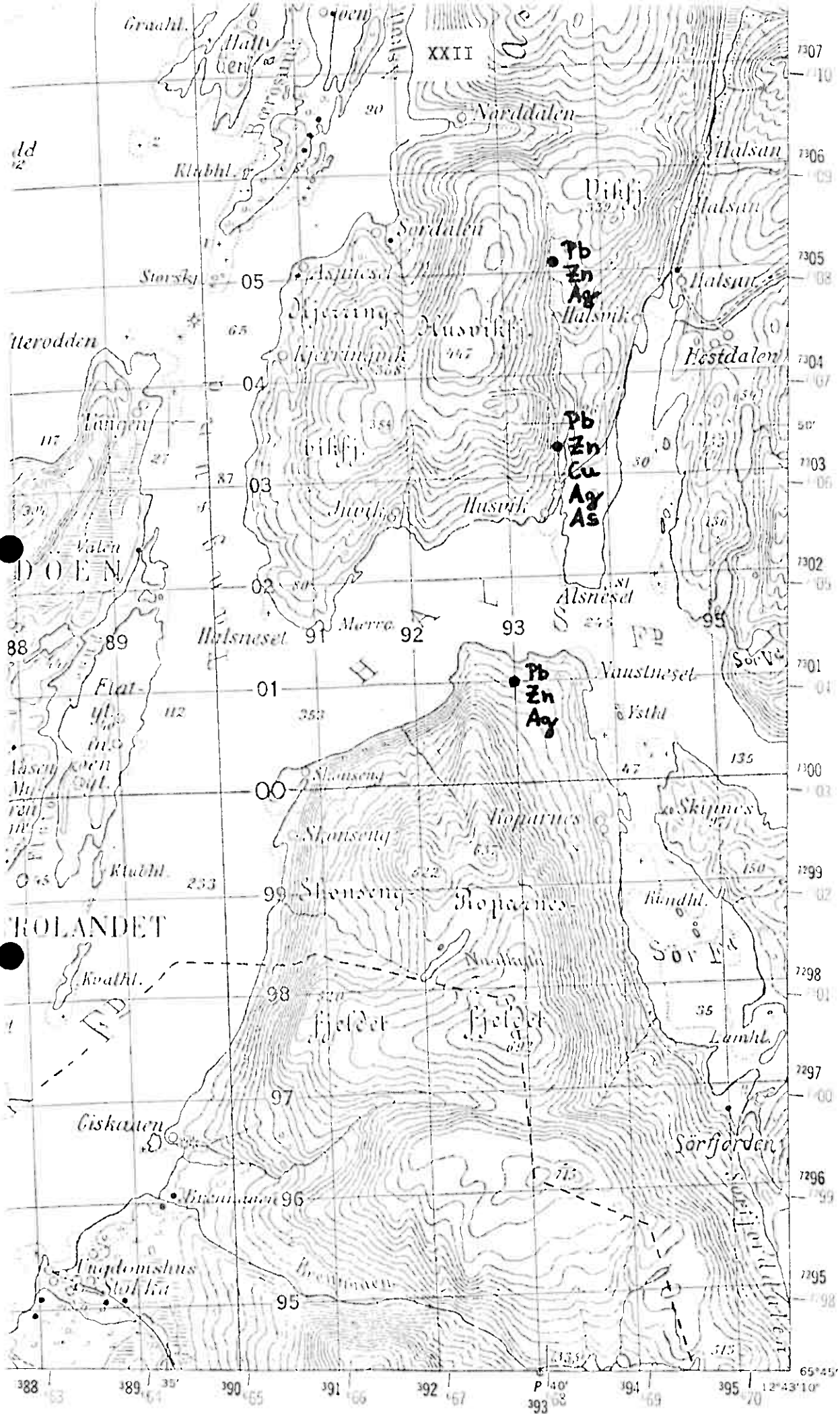
82

81

80







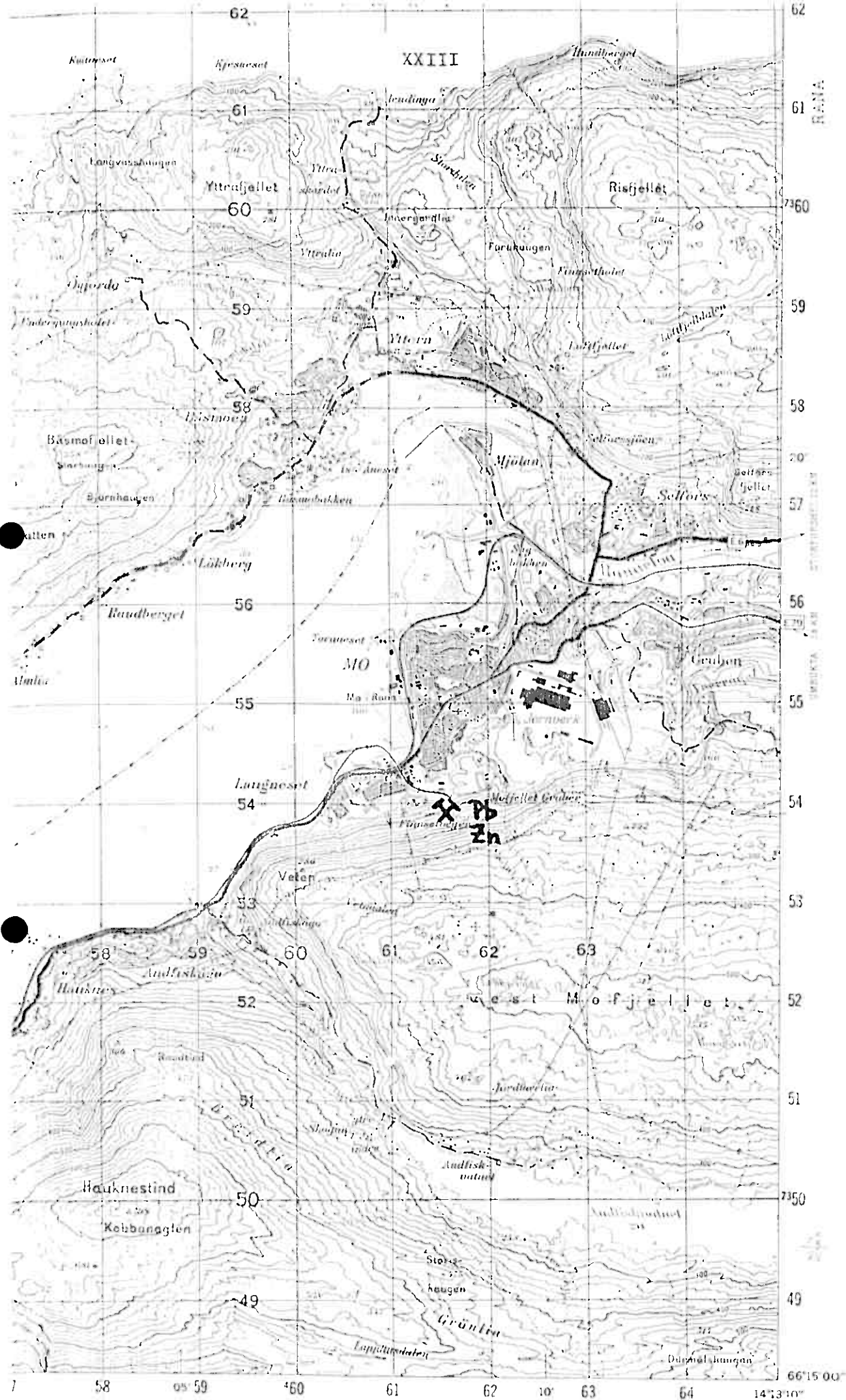
TRYKT I NORGES GEOGRAFISKE OPPMÅLING 7: 78

INDEX TO ADJOINING SHEETS

ISLEIGH INFORMATION 1952

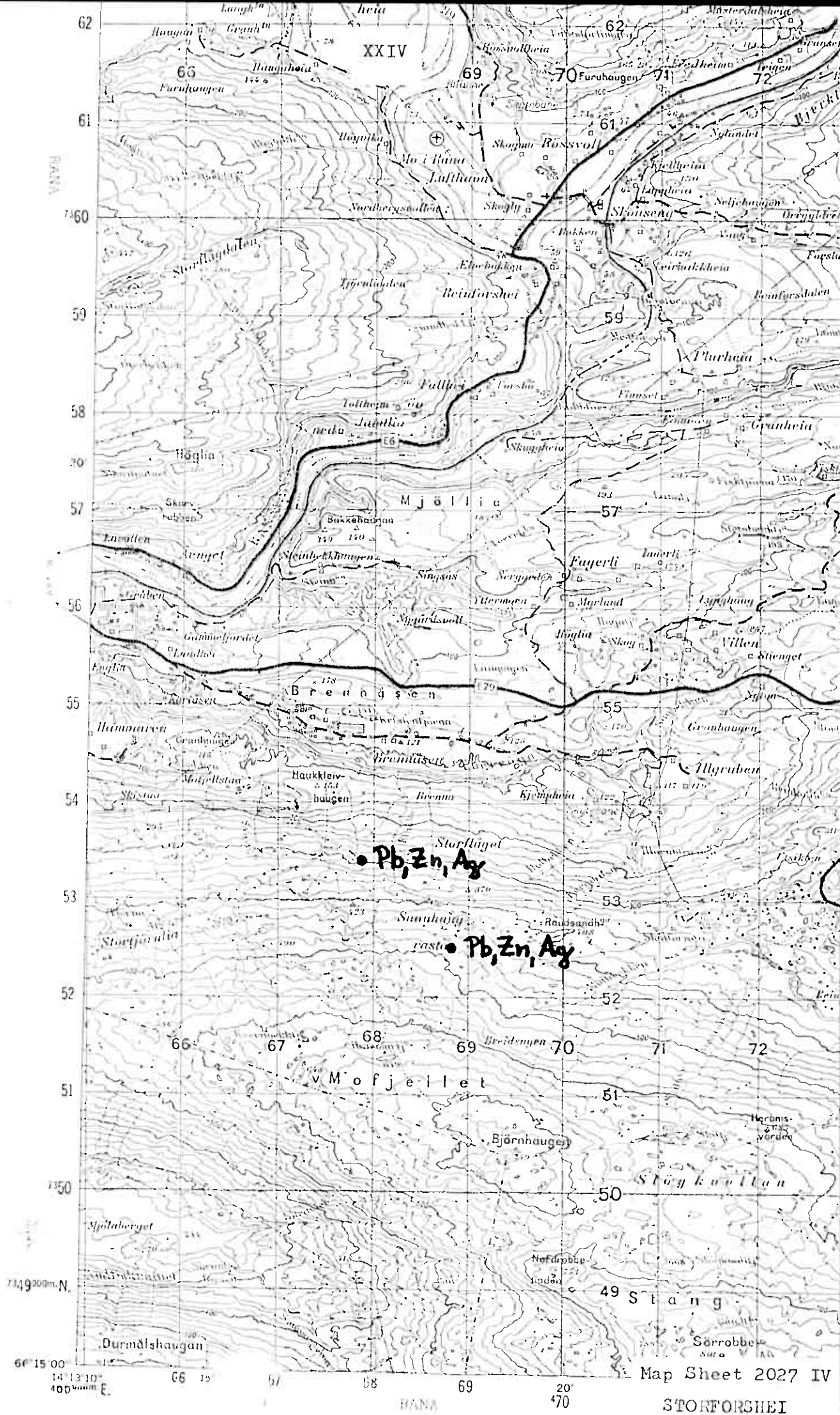
Map Sheet 1826 IV

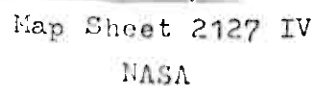
TJÖTTA

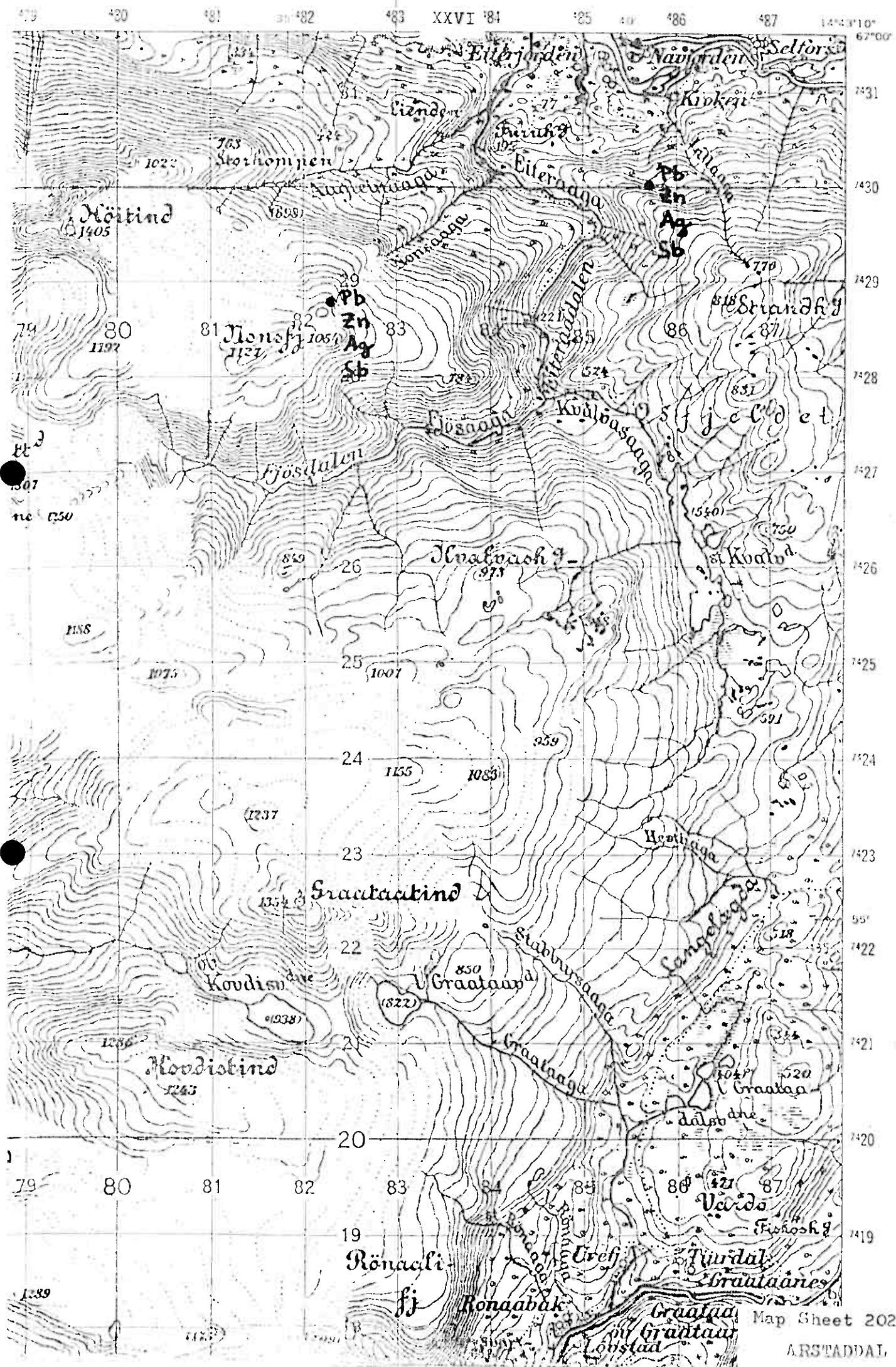


Map Sheet 1927 I

TRYKT I NORGES GEOGRAFISKE OPPMÅL MO I RANA
 ETTERTRYKK ULOVLIG. NGO HAR ALL RETT ETTER LOV OM

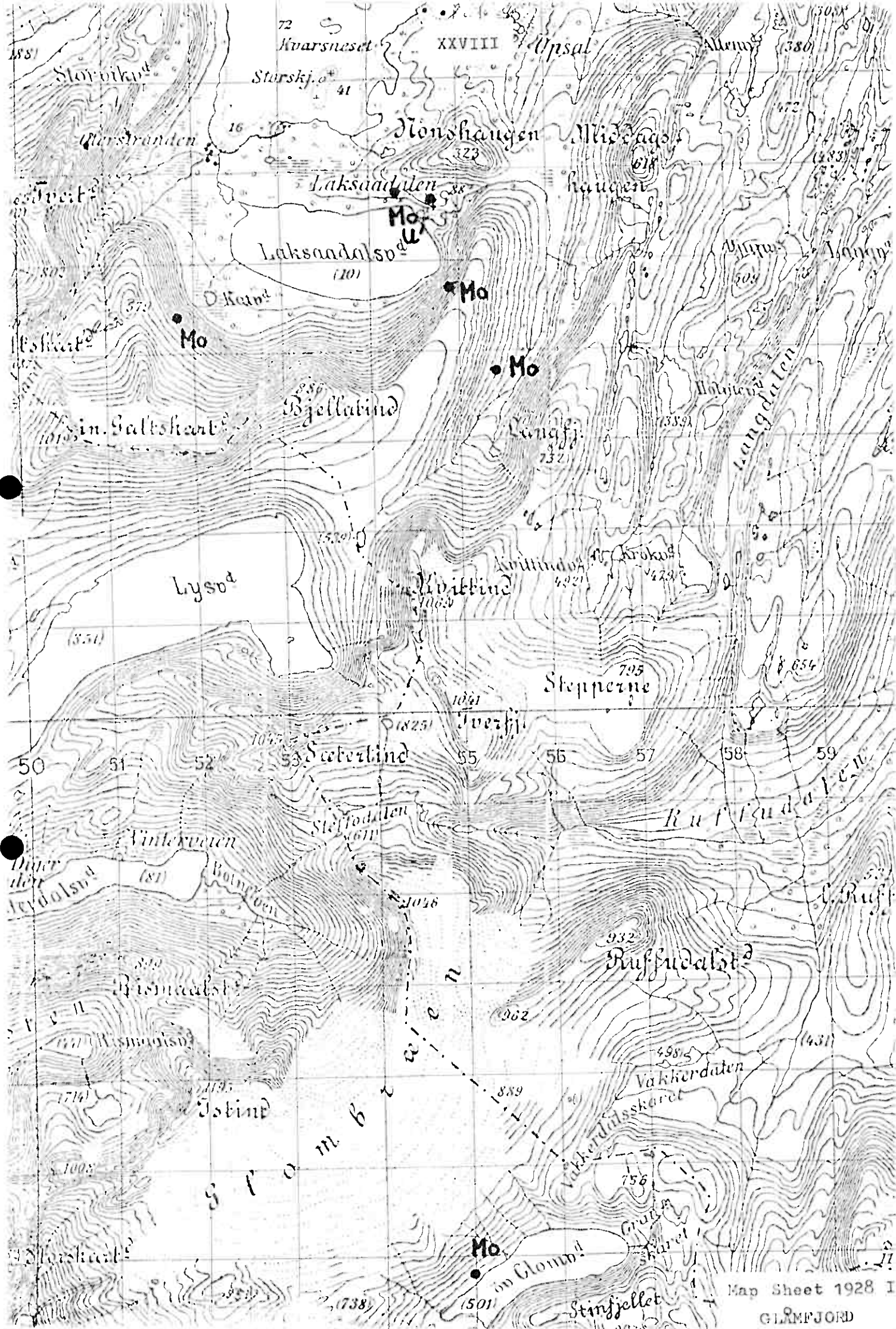


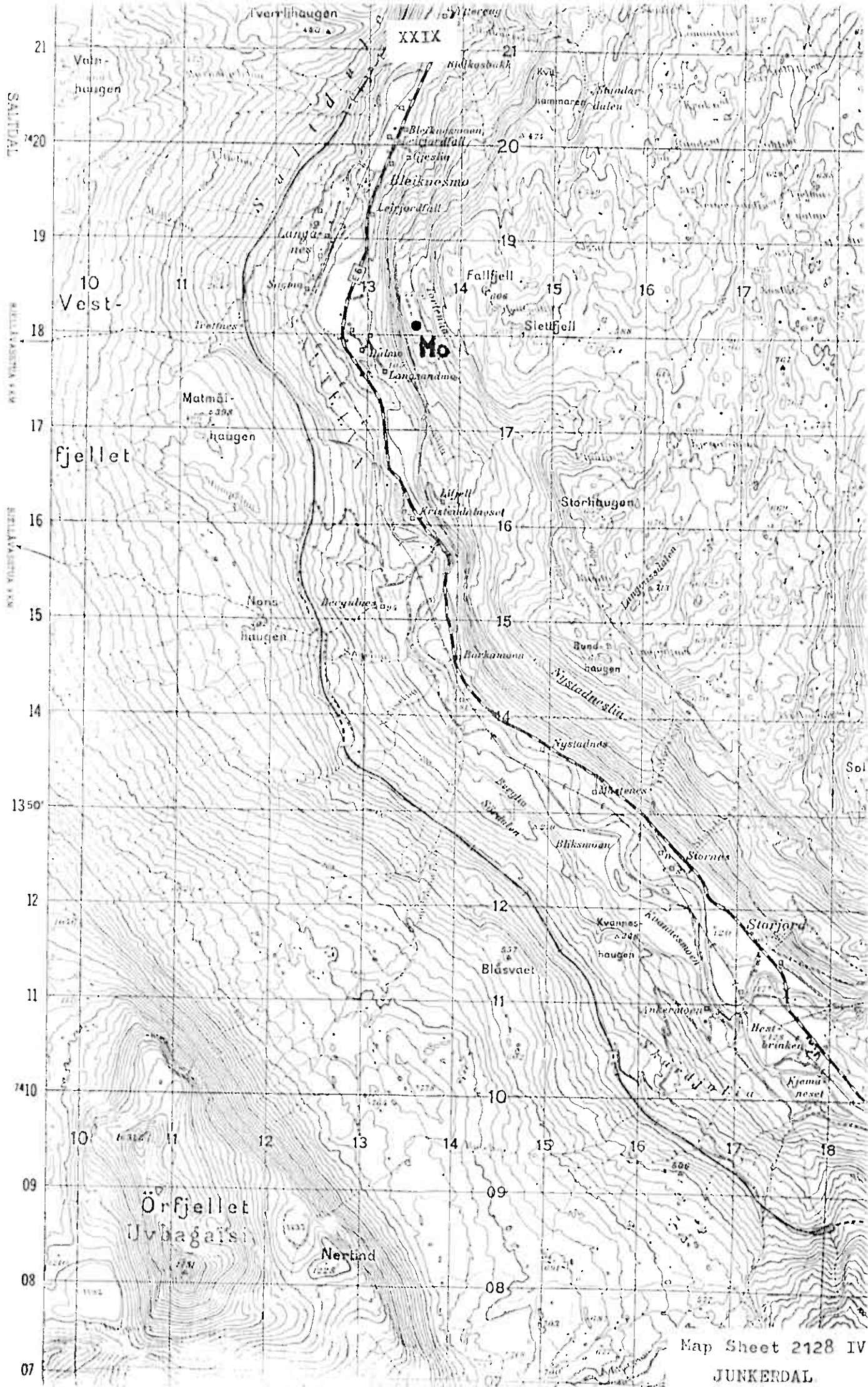


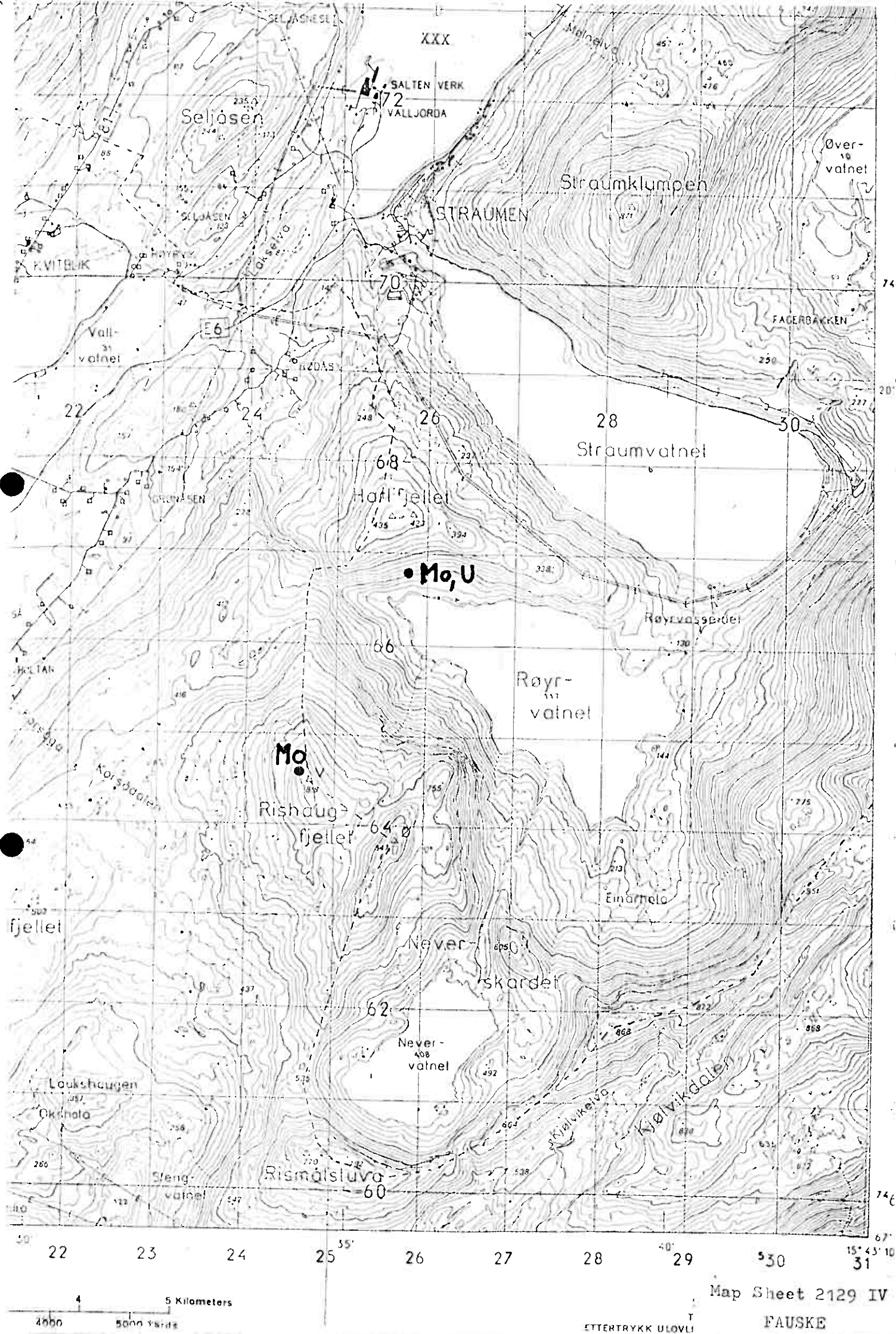


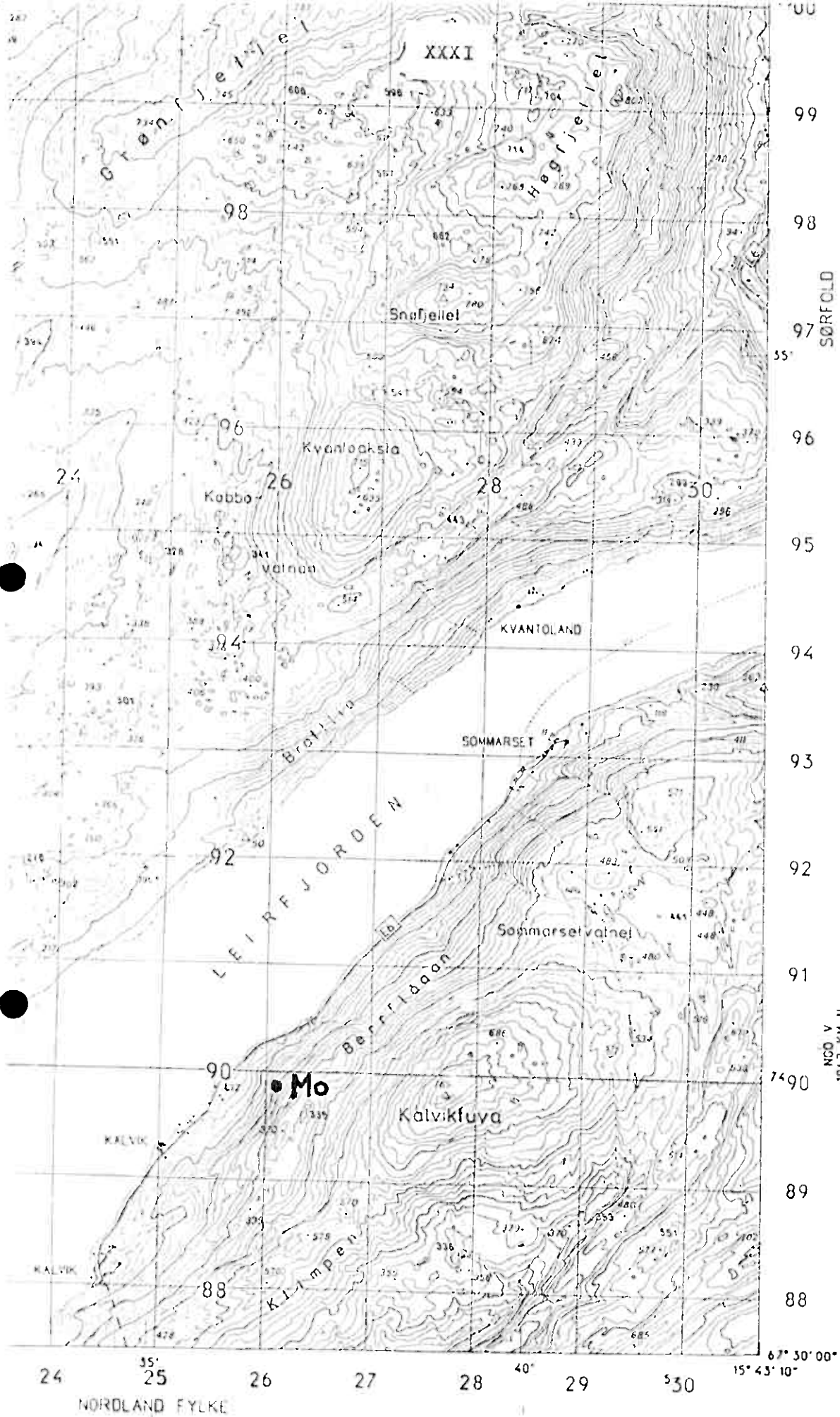
A horizontal scale bar with markings at 2°, 1°, 0°, 1°, 2°, and 3°. The markings are evenly spaced along a horizontal line.

This is a detailed topographic map of the Suseidal area in Norway. The map features contour lines indicating elevation, with major peaks reaching over 800 meters. Several rivers and streams are depicted, including the Pundalselva and Mikkeljordelva. Numerous settlements and farms are labeled, such as Pundalsli, Kampfjell, Mikkeljord, and Storhaugen. A legend in the upper left corner identifies mineral deposits: Pb (lead), Sb (antimony), Zn (zinc), Cu (copper), As (arsenic), and Ag (silver). The map is titled 'Map Sheet 1925 I' and 'SUSEIDAL'.









75

es

Nautical Miles

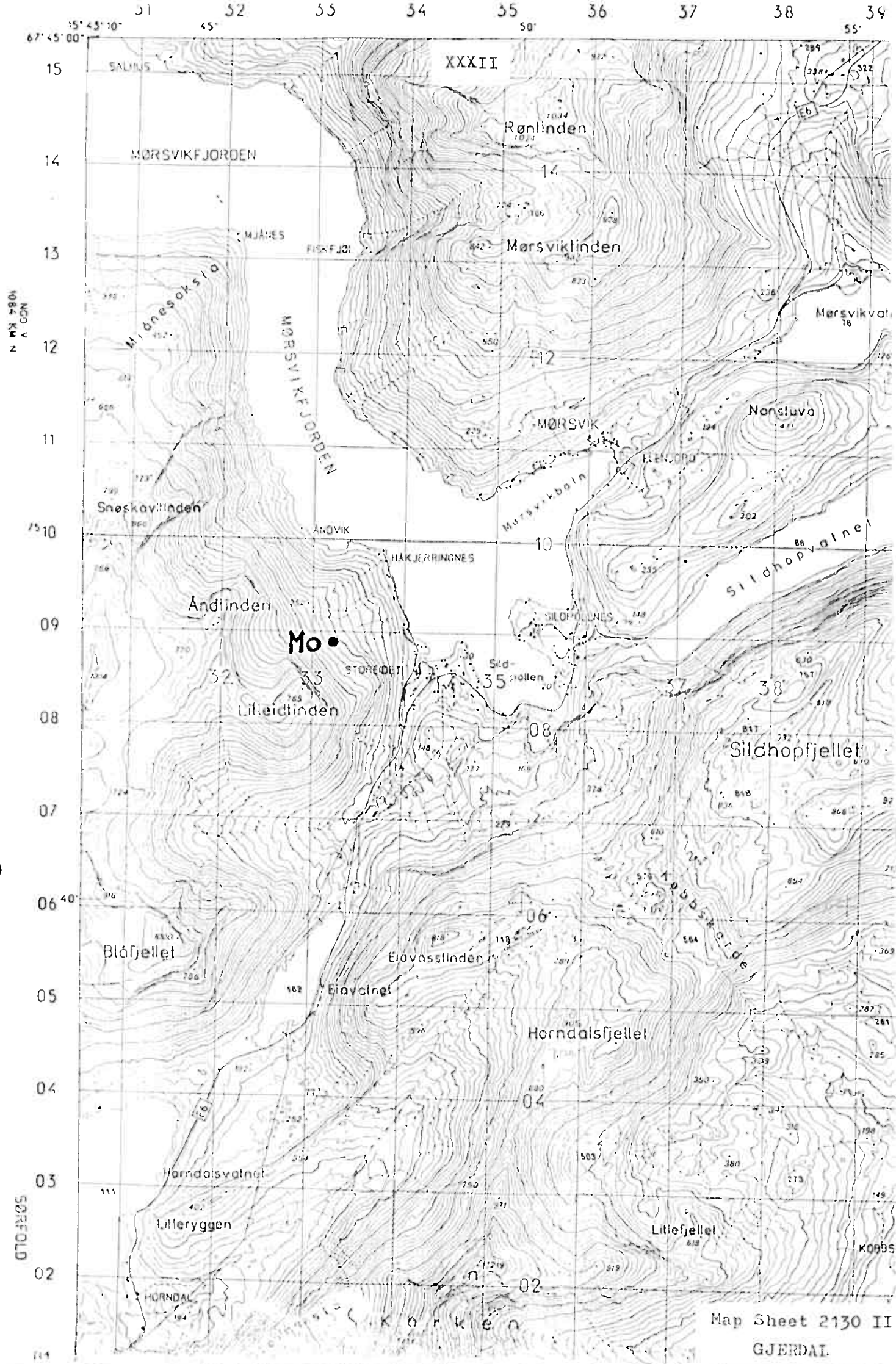
NGO V
52 KM V

TRYKT I NORGES GEOGRAFISKE OPPMÅLING 6-82
EITERTRYKK ULOVLIG. NGO HAR ALL REIT EFTER LOV OM ÅNDSVERK

Map Sheet 2130 III

HELLDALISEN

MAGNETISK NORD



ryggen

Skjeg
Seitor

XXXIII

Haarskallhaun

Tjelodden 48

O F O T

BARÖEN

Baröen Fyl
Aksellhaun

Lyngosen 82

Sarffj

Mo
Morffj 277

Rævlsöen

Vestreværet

Krauk
Sand
Skj

Baröodden

Tynnhl

Kobhol

Valle Korsnes

Spärthl

Bubergviken

l. Bremviken

st Bremviken

Bremneset

Bremnesskj

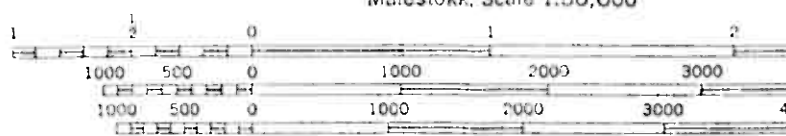
T H S J O R D E N

Map Sheet 1231 I

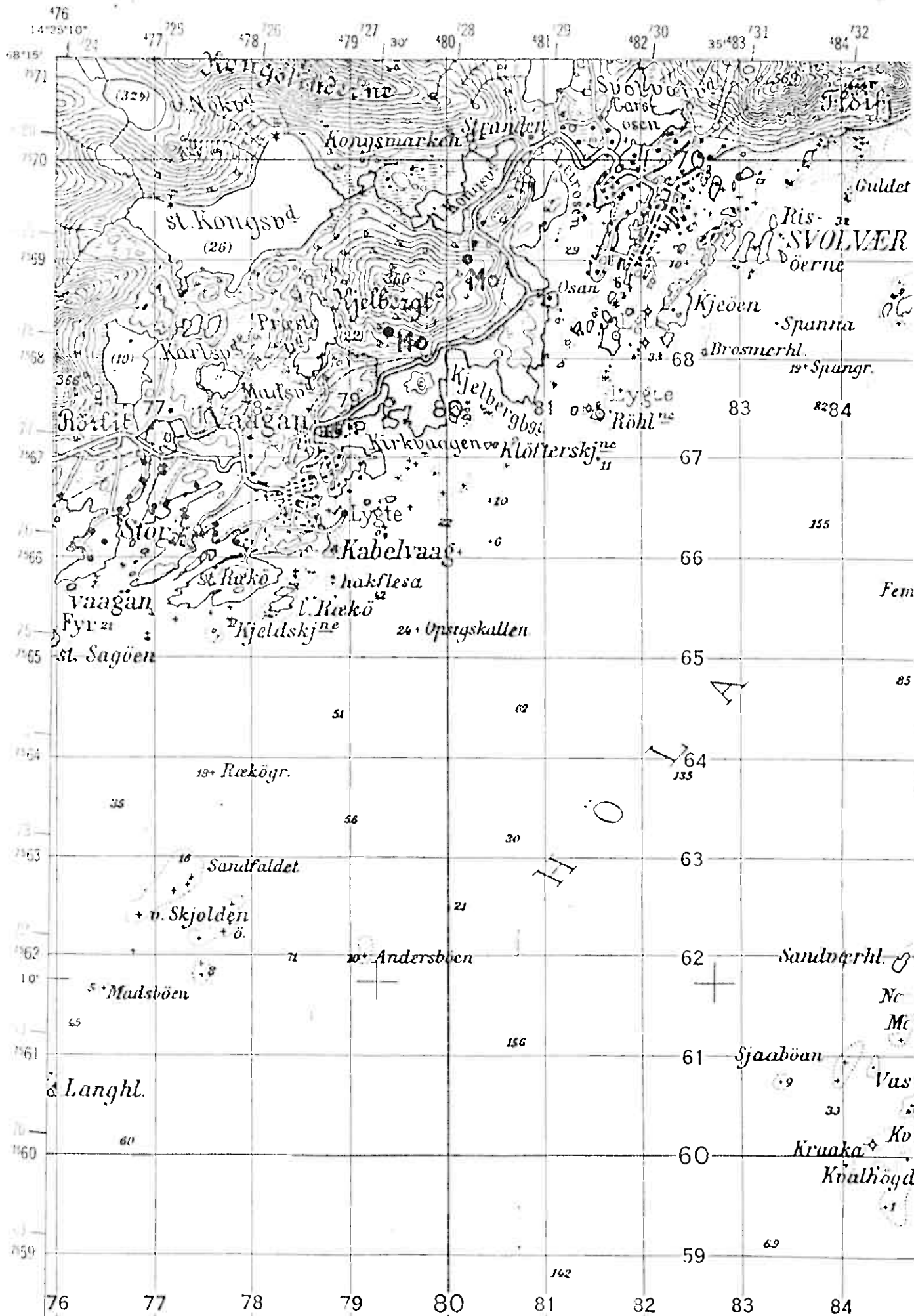
LØDINGEN



ny, Washington, D. C.
ing, Sheets K 9 and



EKVIDISTANSE, CONTO Map Sheet 1131 I
TRANSVERSE MER
HORIZONTAL DATU ODDVÆR





Målestokk. Scale 1:50,000

3 Miles

Map Sheet 1131 IV

KVALNES

INDEX TO ADJOININ