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VOLUME I

SAMMENDRAG

Første delen av denne rapporten handler om resultatene av en fotogeologisk undersøkelse av Rånamassivet med omgivelsene, basert på farge-, sort-hvit- og infrarød-flybilder. Den andre delen presenterer en evaluering av de geologiske informasjoner som de tre typer flybilder har gitt.

Undersøkelsen viser at fargebilder gir de beste resultater for en bestemmelse av lineamenter og av bergartstyper, særlig når det gjelder bergarter som i frisk eller forvitret tilstand har markante fargekontraster med det tilgrensende fjell. Dette er tilfelle for eksempelvis brunforvitrede peridotitter omgitt av gulaktig noritt. De sort-hvite og infrarøde fotografier ga få tilleggsopplysninger av geologisk betydning.

Intrusjonens kvartsnoritt kjerne, lokalt med nokså massivt utseende, er omgitt av en som oftest foldet noritt som fører linser og kropper av peridotitt. Rapporten beskriver de forskjellige peridotittlokaliteter. Pegmatitter forekommer hyppig i området. Ofte er de assosiert med noritt og kvartsnoritt, men de ser også ut til å penetrere peridotitt.

Intrusjonen er omgitt av gneisiske bergarter med en velutviklet foliasjon. Gneisene i Nordbotnområdet viser en komplisert struktur, og de fører pegmatitter. To forskjellige gneistyper som forekommer nordøst i massivet er omtalt. Soner med kalksilikatbergart og amfibolitt forekommer i gneisen syd for massivet.

Foliasjonen i gneisene langs sydgrensen av massivet viser et moderat til bratt fall mot nord, mens på nordsiden faller den bratt mot sydvest.

Glasiasjonen har satt igjen mange spor etter seg i området, slik som bunnmorener, eskere, side- og endemorener. Eskerene og moreneryggene er markante på grunn av isens sene tilbaketrekning, og mange breer eksisterer fremdeles.

For den andre delen av rapporten ble tre forskjellige områder valgt slik at alle de kartlagte bergarter er representert, og fototolkninger ble laget for hvert område, dvs. Arneshestområdet, Nordbotnområdet og Saltvikvann-Rødfjell-området.

Evalueringen viser at fargebildene er best egnet for litologisk identifisering, særlig i områder med kontrasterende bergartsfarger (sure vs. basiske bergarter, f.eks. pegmatitt vs. noritt; brune forvitringssoner i ultrabasiske bergarter, f.eks. peridotitt; sonarfordeling, e.g. gneis vs. amfibolitt vs. kalksilikatbergarter).

Fargeinfrarødbildene er mest hensiktmessige for bestemmelse av vegetasjonstyper, kvartæravsetninger, fluvioglasiale avsetninger og tallus.

Sort-hvitbildene, vurdert ut fra en strukturell synsvinkel, er ikke vesentlig ringere enn fargebildene. De er imidlertid billigere

STRUCTURAL AIRPHOTO INTERPRETATION BY USING COLOUR PHOTOGRAPHY

Scope of investigation

Although a detailed geological mapping of the north-western part of the Råna noritt area had been carried out in 1972, it was considered useful that a geological air photo interpretation be made as a preliminary step toward the mapping of the remaining larger part of the area, which was scheduled to begin in 1973, particularly in relation to the occurrence of fractures, joint systems, faults, folding or other tectonic features.

The air photo interpretation was started early in 1973 and finished in May 1973. It was based on a set of 148 colour photographs, scale 1:10 000, made by Fjellanger-Widerøe A/S on August 30, 1972.

A set of 136 colour infrared photographs and a set of 129 black-and-white photographs supplemented the geological interpretation.

The colour infrared photos were made on the same scale and on the same date as the colour photos. The black-and-white photographs are just prints of the colour negatives. Both sets of photographs were studied in the fall of 1973 and the beginning of 1974.

Previous work

The area under consideration has been mapped and described several times in the past: f.ex. by Steinar Foslie (NGU Årbok 1920, NGU Bulletin 149, 1941, pp. 158-170) and by Magne Gustavson (NGU Bulletin 261, 1969, NGU Bulletin 238, 1973). The southern part of the area appears also on the geological map of Tysfjord by Steinar Foslie (1931). An electromagnetic survey was made between June and August 1972 (Elektromagnetiske bakkemålinger Bruvann-Råna, NGU rapport nr. 1110).

Presentation

Both series of photographs (colour and colour infrared) used

in this study were taken at a flight height of 2300 m above sea level. But, as the Råna area is a mountanous region with summits of more than 1300 m, the actual flight height over the highest peaks is about 1000 m. This means that the resulting images show a difference in scale between lowlands on the coast and the high summits; the latter are represented at a larger scale than the former. Moreover the topography at several places is extremely steep. A larger displacement thus occurs on the air photos, making the construction of a reliable photomosaic impossible. Therefore the interpretation results have been plotted on a photogrammetric map, scale 1:10 000 made by Fjellanger-Widerøe A/S.

Results

General remarks

The names used in this description of the various rock units must not be considered as petrographical, but merely as: 1. a way to differentiate those rocks which show different morphology or structural properties on the air photos, and 2. to indicate roughly the type to which a certain rock belongs (i.e. acid or basic igneous rocks, metamorphic or sedimentary rocks). Information from personal communication is also taken into account. For example: "Pegmatitt" stands for any light-coloured rock which can be detected on the air photos (trondhjemites, pegmatites, quartz veins or lenses); the designation "Peridotitt" includes also pyroxenite.

For the first geological photo interpretation of the Råna area, colour photos were chosen, and it was a good choice, as will be pointed out later in this section and in section 2. of this report.

Photogeological description

Interpretation of the colour photos

The centre of the area under consideration is occupied by a large norite/quartz/norite complex, the greater part of it occurring on the east side of Storvann and a smaller part on the west side.

The centre part of this complex consists of quartz norite, indicated on the photogeological map as KN, which is surrounded by norite, indicated with N on the map. The quartz norite shows a yellowish brown and sometimes a pinkish colour and is rather massive. At Rånkjeipen it forms an escarpment which extends in a southeast direction. The surface above the escarpment is covered with weathered and possibly glacial material. At places where the slope is too steep for loose material to rest, we find outcrops of quartz norite.

The border with norite is not usually seen, specially when it concerns a massive norite.

The main quartz norite body east of Storvann is surrounded on the northeast and south side by norite rock which, in many places, shows a foliated character. Norite has a pale-yellow colour on the colour air photo. It has locally a massive appearance (Nm), as f.ex. in the area of Rødfjell and southeast of Saltvikvann. At other places the rock is more foliated than normal, as f.ex. in the area between Rødfjell and the Rånkjeipen escarpment (sheet Rånkjeipen). Norite is very often associated with peridotite (map symbol P); its brown colour on the colour photo contrasts well with the yellowish norite.

Peridotite occurs frequently in the norite area of Arneshesten. It forms a zone extending from the eastern shore of Bruvann to Arnes on the coast of Ofotfjorden. The rock occurs in long, elongated lenses with a north-northeast orientation.

The eastern slope of Arneshesten ridge is much covered by vegetation, which makes the identification of individual exposures impossible. For this reason the designation N + P has been used, which means: norite rock with an indeterminable amount of peridotite. The brown colour suggests, however, a rather high peridotite content. South of Mataloftet we find another area with peridotite (sheet Tverrfjell): here it occurs in parallel zones on a steep westward dipping slope. A somewhat bigger peridotite occurs west of Tverrfjell at the border of norite and gneiss. Possibly this rock body

is controlled by SW-NE orientated fractures.

Besides the lens-shaped bodies of peridotite there are also more continuous bands, f.ex. west of Tverrfjell and south of the area with peridotite lenses mentioned above.

A more massive peridotite occurs east of Mataloftet but unfortunately its limits can not be traced because of mountain shadow. A rather large peridotite body occurs at the west side of Storvann, just north of Kvanåkertind.

Pegmatites (indicated as Peg on the map) are very common in the whole Råna area. They occur mostly as white coloured veins and lenses along joints and fractures. Most of the veins are too small to be indicated on a map of scale 1:10 000.

Pegmatites are frequently associated with norite. An important set of pegmatite veins can be found south and west of Klubbviktind (sheet Tverrfjell); the veins are approximately parallel and have a steep dip to the northeast or north. They seem also to penetrate into peridotite bodies, f.ex. at Sepmolfjell.

Pegmatite veins occur also frequently SSW of Rødfjell (sheet Rånkjeipen) and between Simlefjell and Sepmolfjell. In the Nordbotn area, west of Kvanåkertind, they are found frequently in gneissic rocks (see below). In the Arneshesten area (sheet Arneshesten) pegmatites seem to be especially connected with norite; the veins disappear at the norite-gneiss contact.

The above described complex body of norite/quartz norite, with its associated peridotite and pegmatite intrusions, is surrounded by gneissic rocks (indicated generally by G), which are well foliated rocks and have a brown-yellow colour. However, the colour is less characteristic than the topographical expression of its structure.

In the southern part of the area (sheet Sepmolfjell and Tverr-

fjell) is found a moderate to steep north-dipping foliation near the border with norite.

In the areas covered by the sheets Saltvikfjell and Rånkjeipen, very steep foliation dips occur at the north and northeast side of the norite.

North of the main norite body there occurs a major fracture parallel with the foliation direction, or at a small angle to it. East of Saltvikvann this fracture diverges into several more or less parallel fracture which continue as a fracture zone in an ESE direction. This fracture zone is marked by a number of lakes and by the growth of abundant vegetation in the low-lying areas.

The steep face of the norite at the south side of the valley (and north of Rødfjell) may be caused by fractures too, but this cannot be proved by photogeological evidence.

In the Hammerfjell area (sheets Rånkjeipen and Saltvikfjell) we find two gneiss variations marked G_1 and G_2 on the interpretation map. G_1 shows a different foliation direction, compared with the neighbouring gneiss (G), while G_2 has a less pronounced foliation and a well developed joint pattern of two systems which are perpendicular to each other. This joint pattern and its oval shape suggests that G_2 might have been originally an instusive granitic rock. At the southside G_2 is bordered by a band of white coloured rock, wedging out in both directions; this rather massive looking rock type is marked Peg.

The gneiss south of G_2 has a foliation which bends around the G_2 body. The gneissic area south of the norite (sheets Tverrfjell and Sepmolfjell) have a banded character.

If we consider first the Nordbotn area, we find an alternation of light coloured pegmatite-rich gneiss and clearly foliated yellowish brown gneiss. The former is marked G_p and has a less pronounced foliation, and shows system of many small fractures, generally with a NE-SW orientation. The foliated gneiss is

marked G_f.

South of the pegmatite-rich gneiss complex, we find a zone with marked brown-yellow colour and a rather well developed foliation, which is marked KS on the map (calc-silicate rock), and a zone which is marked A (amphibolite). The zone KS contains some white veins of probably pegmatitic material. Southwest of Nordbotn the KS zone disappears, or, in any case, it cannot be traced further to the west in the direction of Kjoskakoppi.

The A zone is characterized by its brown colour and its "coarser" foliation pattern; it contains no lenses of pegmatite. Both rock types can be followed in the Tverrfjell area, south of the norite; they are more or less parallel with the norite.

A KS-zone occurs probably also north of Hammerfjell (sheet Saltvikfjell), where it borders the G_2 rock.

Moraine deposits (marked Mor) occur frequently in the Råna area, and are found along slopes and at the foot of the escarpments.

Many of the moraine ridges are still connected with glaciers or snowfields against steep north or northeast facing cliffs. This points to a recent melting and retreat of the ice. We can recognize three types of moraine deposits in the area under consideration: terminal moraine, lateral moraine and ground moraine.

Terminal moraine (moraine ridges, indicated on the map as curved unbroken lines with hooks at the ends) are very common on the east slope of Rånkjeipen. These moraine ridges which are the witnesses of the most recent ice extension are characterised by a rough surface (as seen on the air photos), a complete lack of vegetation and a pale yellow colour. The ice which shaped these moraine deposits has overridden older deposits. They show a pale green colour on the air photo, perhaps due to some kind of vegetation. These older glacial deposits consist of remnants of moraine ridges. A good example of this type of deposit occurs just east of Sepmolfjell, where younger moraine is superposed on older moraine (partly ground moraine).

An example of lateral moraine can be found along both sides of the Tverrfjell glacier.

Ground moraine occurs frequently in the area south and east of Klubbviktind, and further northward. In this area we find also a large number of eskers; long snake-like ridges with a generally north-south orientation. They occur only in comparatively flat areas because of their mode of origin; a fluvial deposit built up in a channel in the decaying ice sheet. Eskers are indicated on the map by an unbroken line flanked by rows of dots to mark the limited lateral extend of the deposit.

On many mountain slopes we find moraine material together with material resulting from rock weathering. If the original rock formation is covered by more than 50 % with weathered material of glacial or postglacial origin, this area is marked K. Where the vegetation becomes significant enough to mask the underlying rock, the word "vegetation" is added on the map. Agricultural land is found along the coast; it has a light green colour.

At elvenes, near the coast of Storvann occur remnants of a quaternary terrace (marked Ter), indicating a former higher water level.

Deposits along the coast of Ofotfjorden and Storvann, which are marked Al, are the youngest, and consist of clay or beach sand.

Fractures are best developed in gneisses (sheets Saltvikfjell, Rånkjeipen and Sepmolfjell). The main fractures in the north-eastern area have a WNW-ESE direction and can be followed for a long distance. The parallel fractures in the Saltvikvann area may represent a fault zone in the gneiss just north of the norite.

The above mentioned fracture system is crossed by fractures with a NE-SW orientation. On the west side of Skjomen this system takes a more E-W direction. Thirdly we find a system of smaller fractures with a NNW-SSE orientation. The two last mentioned fracture systems occur in gneiss as well as in norite.

Around Klubbviktind there are a few NE-SW and ENE-WSW orientated fractures, whereas the course of the Eiterelv is controlled by a set of N-S orientated fractures.

The fractures in the area west of Storvann have a somewhat different orientation; in norite we find rather important fractures with a NNW-SSE and NNE-SSW direction.

It seems possible that these directions formed a control for the peridotite lenses on Arneshesten. Furthermore, we find a clearly marked fracture system with NE-SW direction in this region.

A set of NW-SE fractures occurs both in norite-peridotite rock and in gneiss.

The Nordbotn area presents a more complicated situation. Here we find fractures which run parallel to the foliation, and others at a small angle to it.

There occur also fractures in NW-SE and NNE-SSW directions. Many smaller fractures or joints lined with pegmatite have a NE-SW orientation.

Interpretation of the colour infrared photos.

In examining the colour infrared photos of the Råna area, two colour phenomena strike the eyes of the observer immediately, namely the deep red colour of vegetated areas and the bluish gray colour of unconsolidated rock material.

The deep red colour is caused by the high reflectancy property of foliage for the infrared part of the spectrum; different types of vegetation give also different tonal variations of red.

Unconsolidated, weathered rock material and glacial block and pebble fields have a blue-gray colour. For an unexplained reason the norite of Arneshesten has a pale blue colour, especially where the rock is exposed horizontally; moreover, it shows a

very smooth surface.

Glacial, fluviatile and slope deposits with the typical blue-gray colour are found for example around Simlefjell, and east and north of Sepmolfjell. In the flat area around Bruvann these deposits are covered with vegetation (red colour).

Gneissic rocks are represented by a pale yellow colour. peridotites have a remarkable green colour and can easily be distinguished from norite, as f.ex. on the northeastern part of Arneshesten.

Lens- and vein-shaped acid intrusives (pegmatite, trondhjemite) have a white colour.

Considering the pegmatite-rich area west and southwest of Klubbviktind, it seems that the veins are not so well represented as on the colour photos. The alluvial deposits along the coast of Ofotfjorden have a slightly purple colour, whereas the pebble beach and the gravel road along the coast show a blue colour.

Eskers are not so ready distinguishable because of their pale yellow colour which has no marked contrast with the yellow gneiss formation on which they occur (sheet Rånkjeipen).

Concerning fractures and faults, a difference in interpretational results arises in the Saltvikvann area; the main E-W fracture can be easily detected on colour infrared photography, but east of Saltvikvann, in the area of a possible fracture zone, the colour infrared photo suggests an elongated zone of schist or gneiss with a well developed foliation parallel to the fault direction.

Generally, it seems that the colour infrared photography does not reveal with accuracy as many details concerning rock boundaries and lineaments as the colour photography.

Interpretation of the black-and-white photos.

The third type of interpretation concerns the analysis of conventional black-and-white photographs. These are black-and-white prints of the colour photos, and therefore this analysis does not differ much from that of the colour series.

The black-and-white photos have an advantage in areas which received little direct sunlight (half-shadow-areas); such areas are completely dark on the colour photos, but they are just light enough on the black-and-white ones to allow detection of foliation or fractures. The contrast between neighbouring rock types, f.ex. norite and peridotite, is less than on the colour photos. Peridotite appears as middle grey, norite light grey, while the coastal alluvial deposits show also a middle grey tonal variety.

Considering such structural features as fracturing, we find that black-and-white photographs are little more advantageous than colour photos; compare f.ex. the sheets Arneshesten, Saltvikfjell, Rånkjeipen or Tverrfjell. Concerning lineaments and rock identifications, the colour photos are generally more useful than the black-and-white ones (compare the sheets Saltvikfjell, Rånkjeipen). The colour infrared and the black-and-white photographs have not substantilly added to the geological information obtained from the colour photos. These colour photos are most advantageous regarding the analysis of rock boundaries and lineaments, whereas colour infrared photos can be profitably used for the interpretation of unconsolidated fluvial and glacifluvial deposits and of different types of vegetation.

In the second part of this report an evalution will be made of the three types of photography in the light of their usefulness for the purpose of geological analysis.

COMPARATIVE PHOTO INTERPRETATION IN THREE SELECTED AREAS OF THE RÅNA NORITE COMPLEX

Introduction

Because of the availability of three types of air photography, namely colour infrared, colour and conventional black-and-white, it seems useful to make a comparative analysis. From the colour photo interpretation of the entire area under study, it became clear that colour photography can facilitate the detection and interpretation of certain rock types.

Three geologically different areas were chosen, in such a way that all the previously determined rock types are presented.

Of each area one air photo (scale 1:10 000) was chosen and the geologic interpretation drawn on a transparant foil. Each area measures approximately 2,3 x 2,3 km.

These areas can be described as follows:

1. the Arneshesten area (sheet Arneshesten), between Arneshesten and Ofotfjorden, consisting of norite, peridotite, pegmatite and gneiss, together with quaternary deposits along the coast in the north and east.

2. the Nordbotn area (sheet Sepmolfjell), with gneiss, pegmatite, calc-silicate rock and moraine deposits.

3. the Saltvikvann-Rødfjell area (sheet Saltvikfjell) with quartz norite, norite, peridotite, pegmatite, gneiss and quaternary deposits.

Photo interpretations based on the three available types of photography were made for each area.

Arneshesten area

Short description

The central part of this area consists almost entirely of norite and peridotite, the latter mostly lens-shaped and orientated in a NNE-SSW direction. Both rock types together form a high ridge extending in the same NNE-SSW direction.

To the west we find a poorly exposed rock type, which was named gneiss in the general interpretation. It occurs on the west slope of the ridge and is covered by much vegetation which becomes denser with decreasing altitude.

On the east slope of the ridge occurs a rock mass indicated with N + P, an alternation of norite and peridotite which cannot be clearly differentiated on the air photo.

At the northern end of the norite-peridotite ridge occurs a different unit with many parallel fractures or shear planes which seem to dip in a northwest direction. This rock mass seems also to consist of an alternation of peridotite and norite, which can be concluded from its brown colour on the colour photo and from observations in the field. The well exposed area of the peridotite-norite ridge shows many fractures. Two main directions can be determined: a SW-NE to a WSW-ENE direction and a NNE-SSW direction. The fractures in the rock mass, just south of Arnes have a NE-SW orientation. In the NE corner of the area occur a number of fractures with orientation NW-SE.

Comparative analysis

Starting with the colour infrared photograph we find a striking colour difference: the vegetated areas have a deep red colour, and the norite rock on the norite-peridotite ridge has a pale blue colour. The peridotite, having a green colour, is easily distinguishable from the norite at places where the rock is well exposed. On the east slope, the rock surface is entirely covered by weathered material and vegetation. The rock at the northern end of the ridge has a different colour and represents probably a mixture of norite and peridotite (see above).

Considering now the colour photo of the same area, we find

different colours; the norite has a yellow colour and the peridotite a brownish colour. Because of the colour differences on each type of photograph, these rock types can easily be outlined as lenses and elongated bodies of peridotite in norite.

The zone marked N + P on the eastern slope of the ridge has a brownish colour, due to intercalations of peridotite in norite. This zone could not be identified on the colour infrared photo. Pegmatites can be readily determined on both types of photography; they occur as white lenses along fractures. The gneiss on the western slope of the ridge is so poorly exposed that its faint colour on both types of colour photography is not very conclusive. The rock has a smooth, low relief as compared to the norite ridge. Quaternary deposits (agricultural land along the coast) presents itself with varieties of purple on the colour infrared photos, which reflects the occurrence of seaweed in the tidal zone. The colour photo shows here a brown line, which represents the natural colour of the seaweed.

Mention must be made of some brown coloured areas in the same coastal area (probably also caused by seaweed); these areas are represented on the colour infrared photograph by a deep blue colour. This can be explained by the fact that the colour photo was taken about 1 3/4 hours after the colour infrared one, and during this period the tide in the small bays had receeded, exposing the seaweed and causing the brown colour on the colour-photo. Now, considering the black-and-white photo, it is clear that with sufficient tonal variation it will be possible to differentiate between different rock types, as f.ex. norite and peridotite (light gray and medium gray respectively) and pegmatite (nearly white). Shadows are not as dark as on the colour photo and they are smaller than on the colour infrared photo. For this reason it was possible to locate more fractures in the northern part of the norite-peridotite ridge of Arneshesten than by using colour infrared.

Lineaments are also shown on the black-and-white photo (equally on the colour photo, but not on the colour infrared photo).

Conclusion

It appears that in the case of well defined colour differences between the various rock types in a special area, a colour photo advisable as a base for geological interpretation.

Concerning a structural interpretation, it seems that both colour and black-and-white photos are useable as a base; the interpretation differs only in details. On the other hand, differences in vegetation types can only be determined by using colour infrared photography. Birch, shurb with foliage and heather give a sharp red colour, while conifers show a more dull red colour in this type of photography.

Nordbotn area

Short description

The Nordbotn area is found near the southern border of the Sepmolfjell sheet. Most of the area consist of gneissic rocks (marked G on the transparent overlay) with locally pegmatites, sometimes rather abundant; there also occur calc-silicate rocks (KS), amphibolite (A) and some quaternary deposits (mor). The gneiss and amphibolite show a more or less parallel arrangement with a E-W orientation. Foliation is parallel to the formation boundaries and has mostly a steep northerly dip. Some zones of gneissic rocks are more foliated (G_f) than others; also the amphibolite shows a rather strong foliation. The gneissic rocks which contain pegmatites, either in concordant veins and lenses or in discordant irregular bodies, are marked G_p; they alternate with the well foliated zones and show less foliation. The foliation in the centre of the area shows a more complicated pattern caused by folding or the intrusion of pegmatitic bodies (or other acid rock), giving rise to a sharp bend in the foliation pattern of the KS formation. The mountain west of this structure seems to consist of an isolated gneiss body with a synclinal structure.

Comparative analysis

Starting with the colour infrared interpretation, we find a red colour characteristic for some kind of vegetation, f.ex. on the KS- and A-formations, and along rivers and lakes, as in the NW corner of the area.

Glacial deposits and weathered material on slopes are rapidly discernable because of their blue colour caused by a lack of vegetation, and because of their rough morphology (blocks, stones, pebbles).

Gneiss has a pale blue-gray colour, but is often covered with some unconsolidated material, with vegetation (variations of red) or without vegetation (blue-gray). The foliated gneiss is represented on the colour photo by a pale yellow to brownish colour. The calc-silicate rock has a brown colour, whereas the amphibolite is shown by a yellow-brown colour. Pegmatites or acid intrusives appear as white lenses and veins both on colour infrared and colour photos. Numerous pegmatites follow cross joints which have a NE-SW or NW-SE orientation.

Gneissic rocks containing much pegmatites have a lighter and grayish colour. Also on the black-and-white photo it is possible to differentiate between the zones KS and A on one hand and the gneiss varieties on the other by making use of their morphology and gray tone.

Pegmatites looks more massive. Boundaries of individual pegmatite bodies are not so clearly visible on the black-and-white photo.

Fractures are better represented on the colour and the black-and-white photos, f.ex. in the northeast corner of the area, where the colour photo and the black-and-white photo show many parallel small fractures (with pegmatite), while the colour infrared photo shows only a few.

Also lineaments (traces of foliation) and foliation dip are

easier to determine with the colour and the black-and-white photos than with the colour infrared photo.

Considering the structure in the centre of the area, the colour infrared and the black-and-white interpretation seems to suggest a synclinal stucture with a westward dipping axis (see in particular the black-and-white interpretation). The colour photo interpretation makes a bending of the foliation around pegmatitic intrusive bodies more reasonable.

Conclusion

Considering the Nordbotn area, the colour photo offers the best possibilities for a geological interpretation, both lithologically as structurally, immediately followed in quality by the black-and-white photo. For the interpretation and analysis of vegetation-covered deposits and of fluvioglacial deposits the colour infrared photo is the appropriate one.

Saltvikvann-Rødfjell area
Short description

This area is found in the upper right corner of the Rånkjeipen sheet. It consists of noritic (N) and quartz noritic (KN) rocks in the southern part of the area and of foliated gneiss in the northern part (G). Along the north side of the large quartz norite massive, which covers much of the Rånkjeipen sheet, we find a rather massive rock containing peridotite bodies (marked P); they are characterised by a different morphology as compared with the neighbouring norite (smooth surface). At the eastern end of this massive norite we find a few pegmatite lenses (Peg) along small fractures.

Just north of this norite-peridotite complex occurs a toptgraphically low lying zone with much vegetation and a number of lakes. Weathered and fluvioglacial material covers the underlying gneissic rock and hides the foliation. Eastward we find a few eskers in this zone. The low lying zone is separated from

norite, of the colour photo makes the determination of peridotites easy, and for this reason the interpretation of the colour photo shows more peridotite exposures than that of a colour infrared one.

The pegmatite in the eastern part of the norite-peridotite mass can be easily seen in all three types of photography.

Concerning the analysis of fractures, it turns out that the black-and-white photo shows more fractures, than the two others, although most of them are also shown by the colour photo interpretation. The main fractures, east of Saltvikvann, have a SE-NW direction, but assume a more ESE-WNW to E-W direction at about 1200 m southeast of Saltvikvann. The black-and-white interpretation shows also a possible N-S fracture about 600 m east of Saltvikvann.

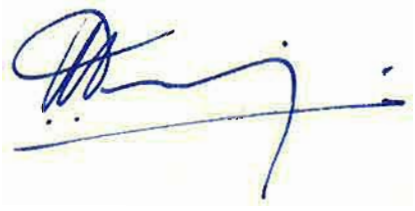
Lineaments are best represented on the colour and the black-and-white photo. Moraine deposits can be more easily found on the colour infrared photo, because of the blue-gray colour for unconsolidated material. In particular the eskers are well marked on this type of photo.

Conclusion

Concerning the determination of structural features, the colour infrared photo is inferior to the other types. Contrasting colours and gray tones are most easily seen on the colour and black-and-white photos. The colour infrared photo is of advantage for the determination of vegetation types, weathered rock material, quaternary deposits or fluvioglacial deposits.

To summarise the above conclusions, it can be stated that colour aerial photography is best suited for geological interpretation purposes in areas where the rocks or their weathering products have contrasting colours. Where this is not the case, black-and-white photographs can be used as effectively and at a considerably lower cost.

Trondheim, april 1975



Fred W. Haarbrink
geolog

VOLUME III

PLATES

17. Strukturell geologisk flyfototolkning av infrarød-bildet 4152 D 14 over Arneshestområdet, målestokk 1:10 000
18. Strukturell geologisk flyfototolkning av farge-bildet 4153 D 15 over Arneshestområdet, målestokk 1:10 000
19. Strukturell geologisk flyfototolkning av sort-hvit-bildet 4153 D 15 over Arneshestområdet, målestokk 1:10 000
20. Strukturell geologisk flyfototolkning av infrarød-bildet 4152 D 5 over Nordbotnområdet, målestokk 1:10 000
21. Strukturell geologisk flyfototolkning av farge-bildet 4153 D 5 over Nordbotnområdet, målestokk 1:10 000
22. Strukturell geologisk flyfototolkning av sort-hvit-bildet 4153 D 5 over Nordbotnområdet, målestokk 1:10 000
23. Strukturell geologisk flyfototolkning av infrarød-bildet 4152 J 14 over Saltvikvann-Rødfjellområdet, målestokk 1:10 000
24. Strukturell geologisk flyfototolkning av farge-bildet 4153 J 14 over Saltvikvann-Rødfjellområdet, målestokk 1:10 000
25. Strukturell geologisk flyfototolkning av sort-hvit-bildet 4153 J 14 over Saltvikvann-Rødfjellområdet, målestokk 1:10 000

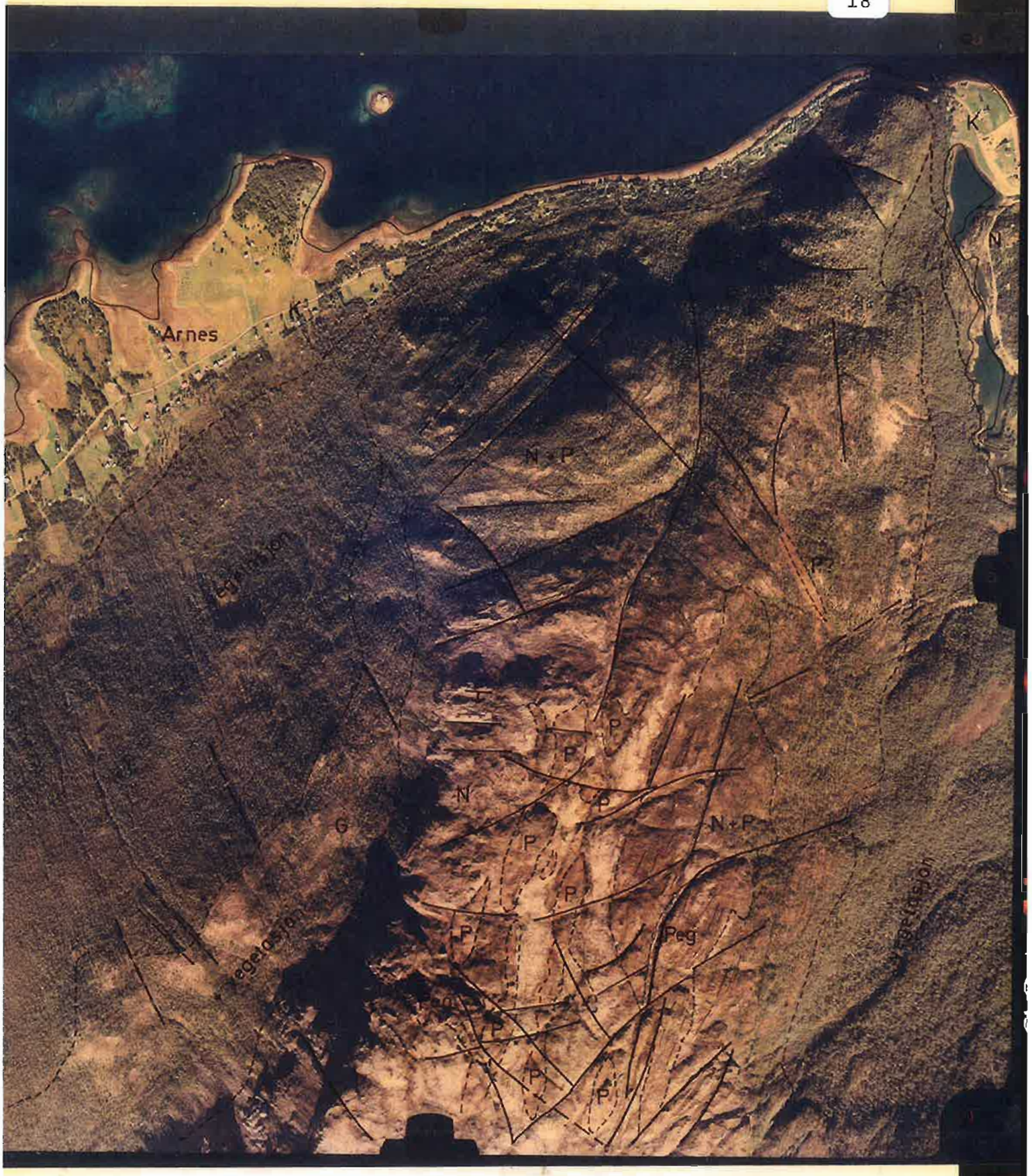
N	NORITT
P	PERIDOTITT
Peg	PEGMATITT
G	GNEIS
K	KVARTÆRAVSETNINGER

———	STORE SPREKKER ELLER FORKASTNINGER
= = =	MINDRE —»— —»— —»—
- - - - -	BERGARTSGRENSE
———	KYSTLINJE

ARNES OMRÅDE

FOTO FARGE 4153 D 15

18



N	NORITT
P	PERIDOTITT
Peg	PEGMATITT
G	GNEIS
K	KVARTÆRAVSETNINGER

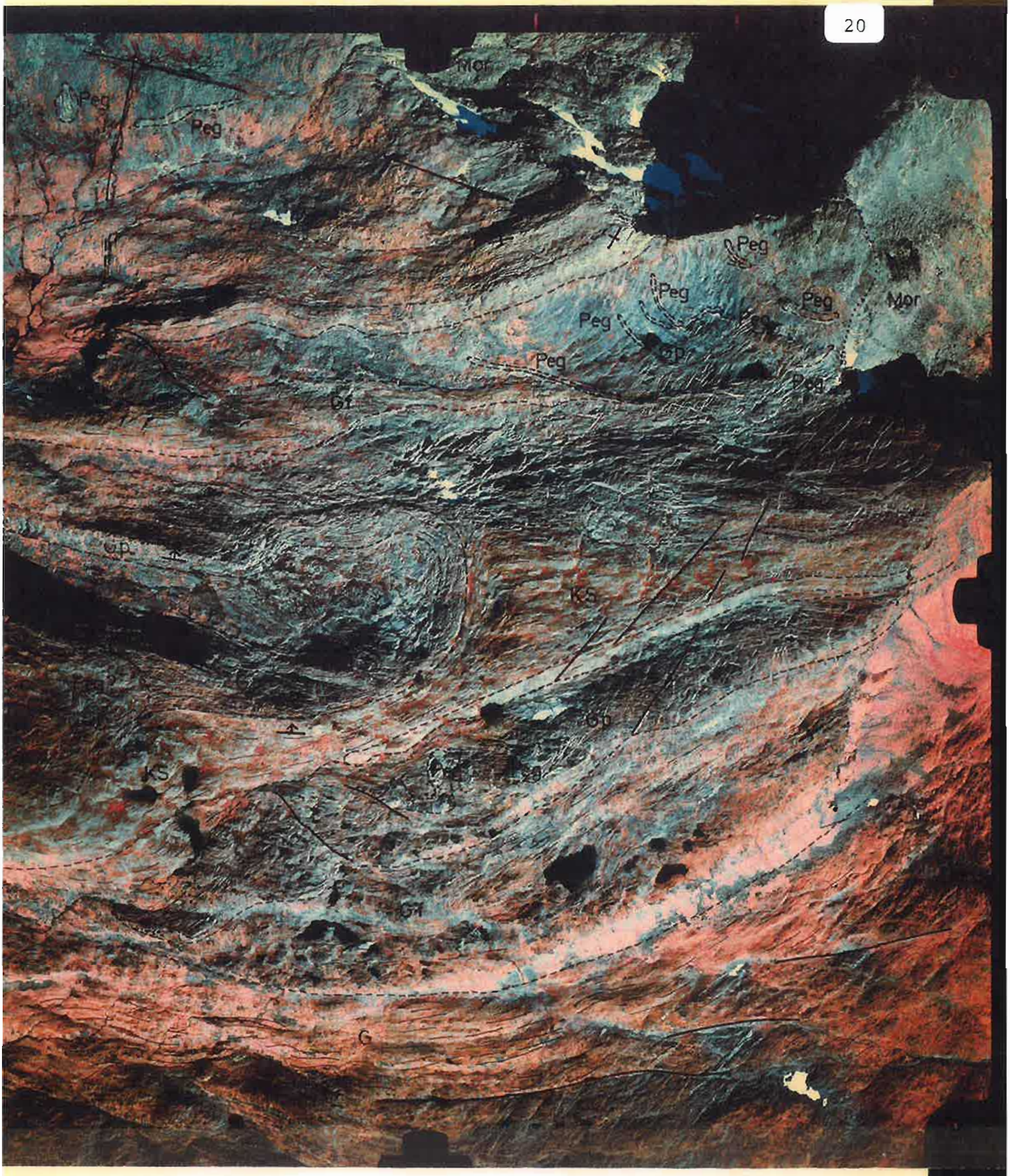
———	STORE SPREKKER ELLER FORKASTNINGER
= = =	MINDRE —"— —"— —"—
- - - - -	BERGARTSGRENSE
═══	BERGARTSSTRUKTURER (skifrighet, båndning)
———	KYSTLINGE
↓	STRØK OG FALL 30°-50° (skifrighet)

ARNES OMRÅDE FOTO SORT/HVIT 4153 D 15

19

N	NORITT	———	STORE SPREKKER ELLER FORKASTNINGER
P	PERIDOTITT	= = =	MINDRE —"— —"— —"—
Peg	PEGMATITT	- - - - -	BERGARTSGRENSE
G	GNEIS	———	BERGARTS STRUKTURER (skifrighet bånd
K	KVARTÆRAVSETNING	———	KYSTLINJE

NORDBOTN OMRÅDE FOTO INFRARØD 4152 D5



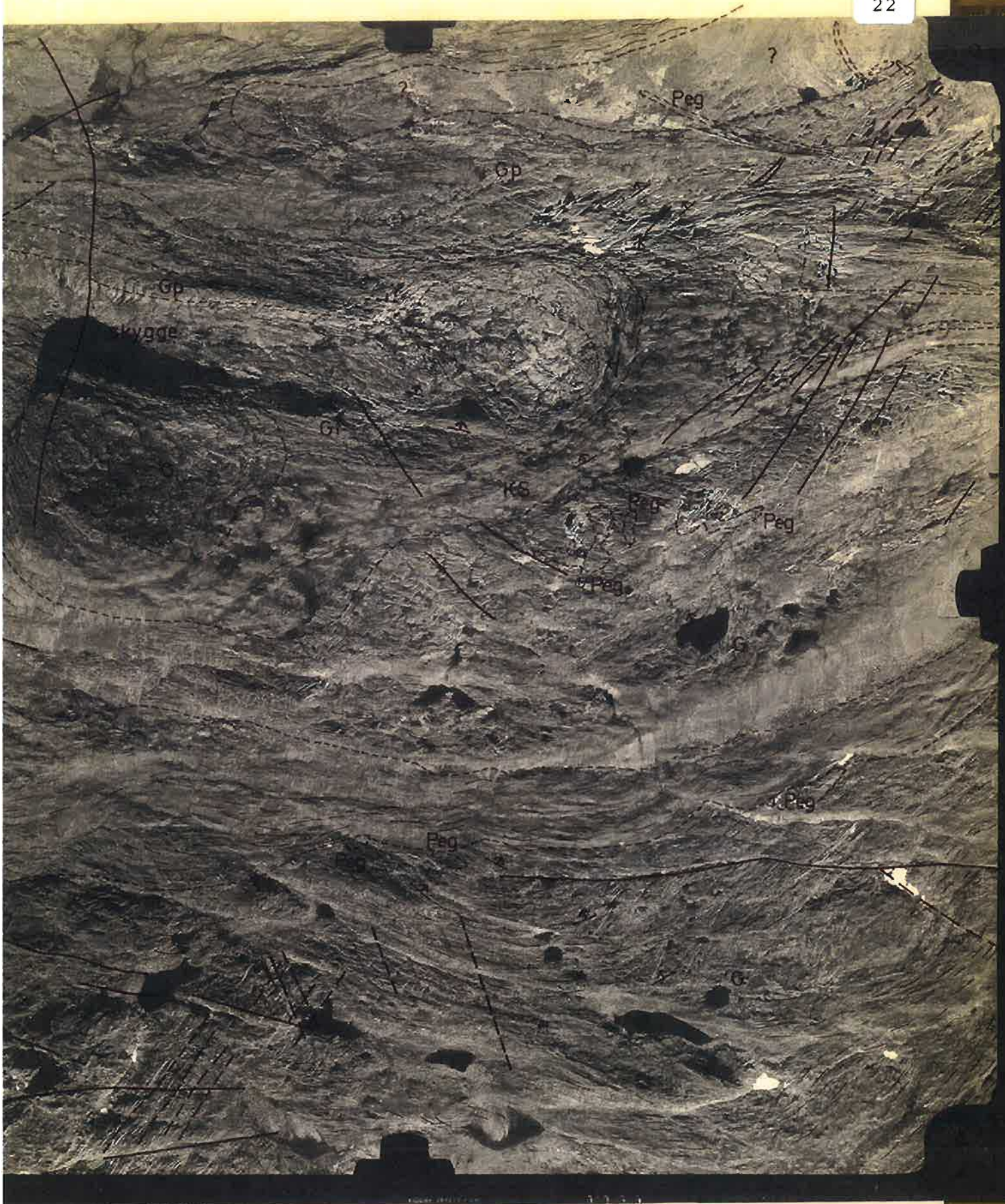
G	GNEIS	———	STORE SPREKKER ELLER FORKASTNINGER
Gf	GNEIS med foliasjon	= = =	MINDRE —"— —"— —"—
Gp	PEGMATITTRIK GNEIS	- - - - -	BERGARTSGRENSE
Peg	PEGMATITT	═══	BERGARTS STRUKTURER (skifrighet, båndin
KS	KALKSILIKAT BERGART		STRØK OG FALL 30°–50° (skifrighet)
Mor	MORENE		—"— —"— —"— 50°–80° —"—
			—"— —"— —"— VERTIKALT —"—

G	GNEIS
Gf	GNEIS med foliasjon
Gp	PEGMATITTRIK GNEIS
Peg	PEGMATITT
KS	KALKSILIKAT BERGART
A	AMFIBOLITT

STORE SPREKKER ELLER FORKASTNINGER
MINDRE —"— —"— —"—
BERGARTSGRENSE
BERGARTS STRUKTURER (skifrighet, båndig)
STRØK OG FALL < 30° —"—
—"— —"— —"— 30°- 50° —"—
—"— —"— —"— 50°- 80° —"—

NORDBOTN OMRÅDE FOTO SORT/HVIT 4153 D5

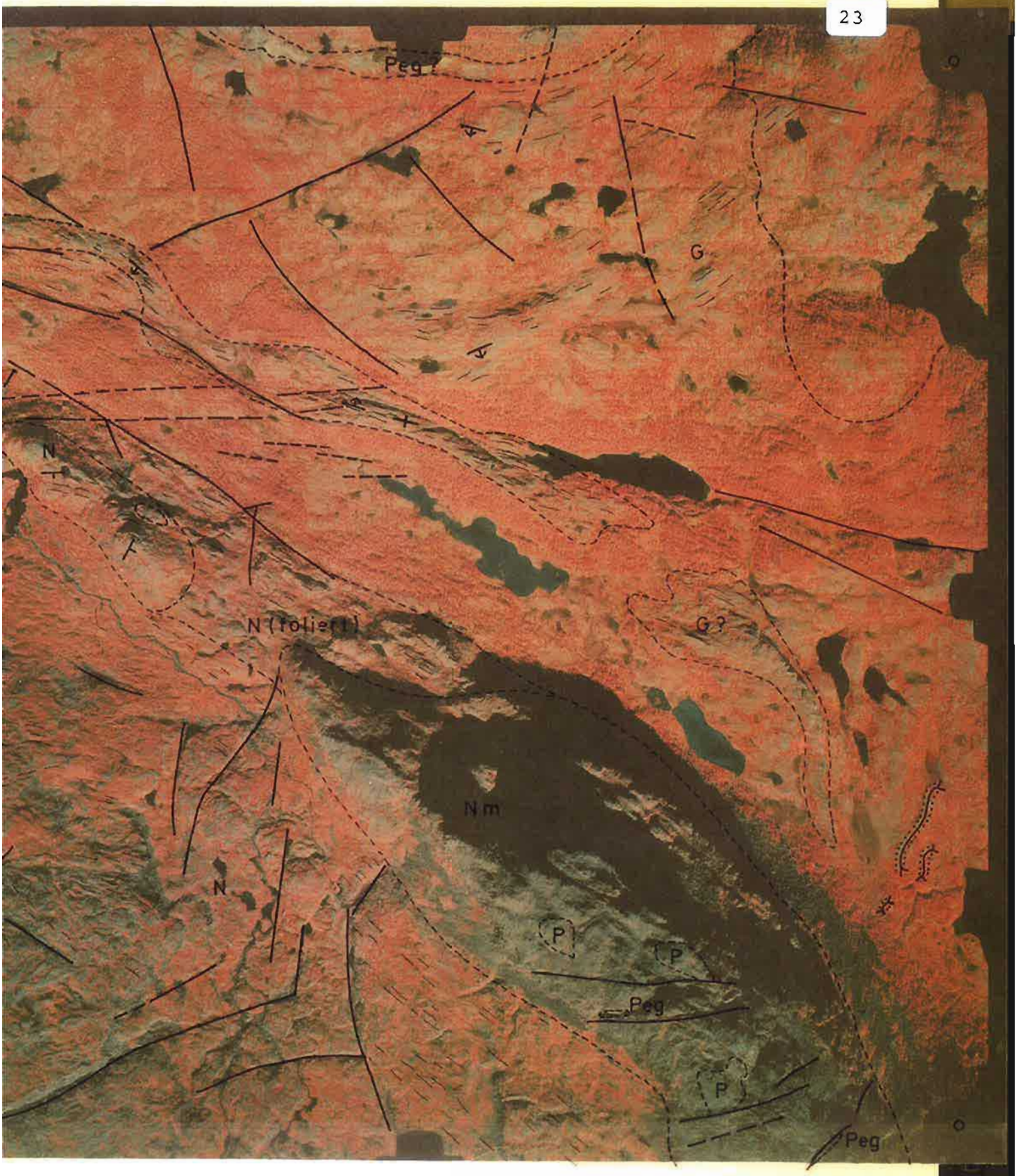
22



G	GNEIS	———	STORE SPREKKER ELLER FORKASTNINGER
Gf	GNEIS med foliasjon	═══	MINDRE —"— —"— —"—
Gp	PEGMATITTRIK GNEIS	- - - - -	BERGARTSGRENSE
Peg	PEGMATITT	═══	BERGARTSSTRUKTURER (skifrighet, båndin
KS	KALKSILIKAT BERGART	⊤	STRØK OG FALL < 30° (skifrighet)
A	AMFIBOLITT	⊤↓	—"— —"— —"— 30°-50° —"—
		⊤↓↓	—"— —"— —"— 50°-80° —"—

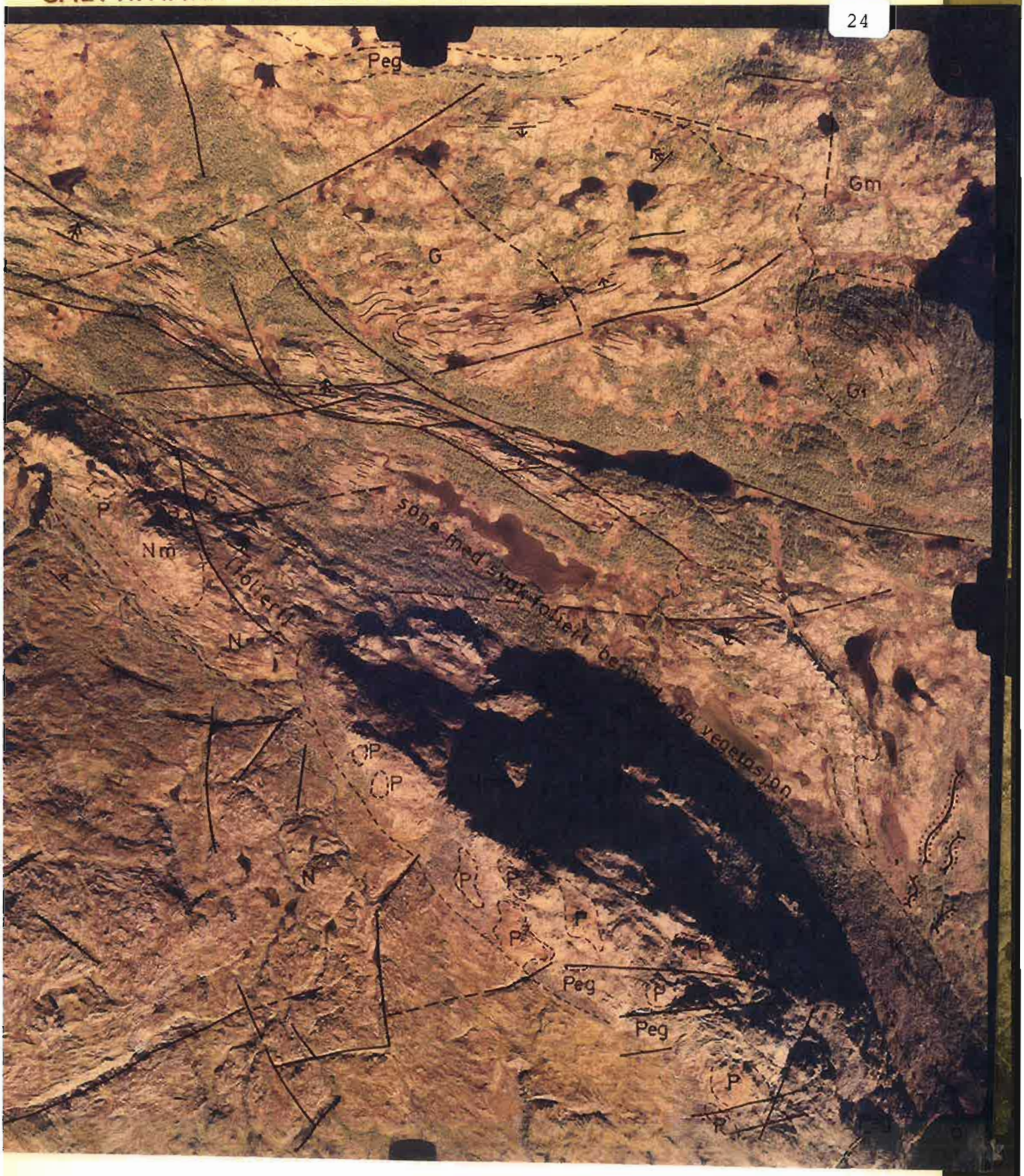
SALTVIKVANN-RØDFJELL OMRÅDE

FOTO INFRARØD 4152 J 14



N	NORITT
Nm	NORITT (massiv)
P	PERIDOTITT
Peg	PEGMATITT
G G_1	GNEISAKTIGE BERGARTER
	ESKER

STORE SPREKKER ELLER FORKASTNINGER
MINDRE —"— —"— —"—
BERGARTSGRENSE
BERGARTSSTRUKTURER (skifrighet, båndingl)
STRØK OG FALL < 30° (skifrighet)
—"— —"— —"— 30°-50° —"—
—"— —"— —"— VERTIKALT —"—



N	NORITT
Nm	NORITT (massiv)
P	PERIDOTITT
Peg	PEGMATITT
G	GNEIS
Gm	GNEIS (massiv)
K	KVARTÆRAVSETNING særlig blokk og stein

ESKER
STORE SPREKKER ELLER FORKASTNINGER
MINDRE —"— —"— —"—
BERGARTSGRENSE
BERGARTSSTRUKTURER (skifrighet, båndning)
STRØK OG FALL 30°-50° (skifrighet)
—"— —"— —"— 50°-80° —"—

SALVIKVANN – RØDFJELL OMRÅDE

FOTO SORT/HVIT 4153 J 14

25

N	NORITT		STORE SPREKKER ELLER FORKASTNINGER
Nm	NORITT (massiv)		MINDRE —"— —"— —"—
P	PERIDOTITT		BERGARTSGRENSE
Peg	PEGMATITT		BERGARTS STRUKTURER (skifrighet, båndingl
G G_1	GNEISAKTIGE BERGARTER		STRØK OG FALL 30°-50° (skifrighet)
	ESKER		—"— —"— —"— 50°-80° —"—
			—"— —"— —"— VERTIKALT —"—

VOLUME II

PLATES

01. Flyfotodekning over Rånafeltet, målestokk 1:50 000
02. Strukturell geologisk flyfototolkning av farge-bilder over kartbladet Arneshesten i målestokk 1:10 000
03. Strukturell geologisk flyfototolkning av sort-hvit-bilder over kartbladet Arneshesten i målestokk 1:10 000
04. Strukturell geologisk flyfototolkning av infrarød-bilder over kartbladet Arneshesten i målestokk 1:10 000
05. Strukturell geologisk flyfototolkning av farge-bilder over kartbladet Sepmolfjell i målestokk 1:10 000
06. Strukturell geologisk flyfototolkning av sort-hvit-bilder over kartbladet Sepmolfjell i målestokk 1:10 000
07. Strukturell geologisk flyfototolkning av infrarød-bilder over kartbladet Sepmolfjell i målestokk 1:10 000
08. Strukturell geologisk flyfototolkning av farge-bilder over kartbladet Saltvikfjell i målestokk 1:10 000
09. Strukturell geologisk flyfototolkning av sort-hvit-bilder over kartbladet Saltvikfjell i målestokk 1:10 000
10. Strukturell geologisk flyfototolkning av infrarød-bilder over kartbladet Saltvikfjell i målestokk 1:10 000
11. Strukturell geologisk flyfototolkning av farge-bilder over kartbladet Rånkjeipen i målestokk 1:10 000
12. Strukturell geologisk flyfototolkning av sort-hvit-bilder over kartbladet Rånkjeipen i målestokk 1:10 000
13. Strukturell geologisk flyfototolkning av infrarød-bilder over kartbladet Rånkjeipen i målestokk 1:10 000
14. Strukturell geologisk flyfototolkning av farge-bilder over kartbladet Tverrfjell i målestokk 1:10 000
15. Strukturell geologisk flyfototolkning av sort-hvit-bilder over kartbladet Tverrfjell i målestokk 1:10 000
16. Strukturell geologisk flyfototolkning av infrarød-bilder over kartbladet Tverrfjell i målestokk 1:10 000

OFOTFJORDEN

BALLANGEN

ARNESHESTEN ▽720

BRUVANN

BLÅFJELL ▽876

SEPMOLFJELL ▽1345

KJOSKAKOPPI

NORDBOTN ▽1086

KVANÅKERTIND ▽1065

STØVELHOLA

STORVATNET

SALTVIKRYGGEN ▽473

SALTVIKVANN

RÅNTINDVANN

RÅNKJEIPEN ▽1200

MATALOFTET ▽979

TVERRFJELL ▽1317 ▽1130 ▽1364

HAMMERFJELL ▽614

RØDFJELL (TVERRFJELL) ▽802

SKJOMEN

KLUBBVIKVANN

KLUBBVIKTIND ▽1329

N

STAVANGER STAAL A/S **RÅNAUNDERSØKELSENE 1973** FLYFOTODEKNING OVER RÅNAFELTET SERIE 4152	MÅLESTOKK 1:50 000	MÅLT	
		TEGN PR	SEPT 1974
		TRAC PR	SEPT 1974
		KFR	SEPT 1974
NORGES GEOLOGISKE UNDERSØKELSE TRONDHEIM	TEGNING NR 1173 B-01	KARTBLAD (AMS) 1331 I	

ARNESHESTEN

0y 1154400x — 6400y 1154400x

OFOTFJORD

ARNES

RÅNA

STØVELHØLA

Rånelva

Kringelvann

Bruvann
421.3

STORVATNET
13.0

ARNESHESTEN

Mange Peg ganger i N

Kvitfjellet

→ vegetasjon

1149600x 0y — 1149600x 6400y

RÅNA – 1:10.000 E-O·240/241

STAVANGER STAAL A/S

Konstruksjon: FJELLANGER/WIDERØE

Reprografi: Norges geologiske undersøkelse

TEGNFORKLARING:

P	PERIDOTITT
N, Nm	NORITT
K.N	KVARTS-NORITT
Peg	PEGMATITT
G, G_1, G_2	GNEIS
Ks	KALKSILIKATBERGART
A	AMFIBOLITT
Gr	SURE INTRUSIVBERGARTER
m	MASSIVE BERGARTER
Al	ALLUVIALAVSETNINGER
Ter	TERRASSE
Mor	MORENE

MORENERYGG ELLER ESKER

K — UNDERLIGGENDE BERGART > 50% DEKKET MED KVARTÆRAVSETNINGER OG VEGETASJON

BERGARTSGRENSE

GRENSE FOR KVARTÆRAVSETNINGER OG ISBREER

BRUDDSONE ELLER STØRRE SPREKK

MINDRE BRUDDSONE ELLER SPREKK

STRUKTURER SOM BÅNDING, SKIFRIGHET O.S.V.

SKIFRIGHET, FALL < 30°

—"— —"— 30°-50°

—"— —"— 50°-80°

—"— VERTIKAL

SKRENT

OVERSIKT OVER KARTSERIEN:

	SALTVIKFJELL
ARNES-HESTEN	RÅNKJEIPEN
SEPMOL-FJELL	TVERRFJELL

STAVANGER STAAL A/S

RÅNAUNDERSØKELSENE 1973

STRUKTURELL GEOLOGISK FLYFOTOTOLKNING AV FARGE-BILDER

NORGES GEOLOGISKE UNDERSØKELSE TRONDHEIM

MÅLESTOKK	OBS.		
1:10 000	TEGN.		
	TRAC. PR.	OKT. 1974	
	KFR.	NOV. 1974	
TEGNING NR.	1173B - 02	KARTBLAD NR.	1331 I

1173 B-05

ARNESHESTEN

0y
1154400x
6400y
1154400x

OFOTFJORD
ARNES
RÅNA
Rånbogen
STØVELHØLA
Rånelva
Kringelvann
ARNESHESTEN
STORVATNET
13.0
Bruvann
Kallskåldam
Mor
556.0
701.28

1149600x
0y
1149600x
6400y

TEGNFORKLARING:

P PERIDOTITT	MORENERYGG ELLER ESKER
N, Nm NORITT	K UNDERLIGGENDE BERGART > 50% DEKKET MED KVARTÆRAVSETNINGER OG VEGETASJON
K,N KVARTS-NORITT	BERGARTSGRENSE
Peg PEGMATITT	GRENSE FOR KVARTÆRAVSETNINGER OG ISBREER
G, GG$_2$ GNEIS	BRUDDSONE ELLER STØRRE SPREKK
Ks KALKSILIKATBERGART.	MINDRE BRUDDSONE ELLER SPREKK
A AMFIBOLITT	STRUKTURER SOM BÅNDING, SKIFRIGHET O.S.V.
Gr SURE INTRUSIVBERGARTER	SKIFRIGHET, FALL < 30°
m MASSIVE BERGARTER	30°-50°
Al ALLUVIALAVSETNINGER	50°-80°
Ter TERRASSE	VERTIKAL
Mor MORENE	SKRENT

OVERSIKT OVER KARTSERIEN:

	SALTVIKFJELL
ARNES-HESTEN	RÅNKJEIPEN
SEPMOL-FJELL	TVERRFJELL

RÅNA – 1:10.000 E-O·240/241

STAVANGER STAAL A/S

Konstruksjon: FJELLANGER/WIDERØE

Reprografi: Norges geologiske undersøkelse

STAVANGER STAAL A/S **RÅNAUNDERSØKELSENE 1973** STRUKTURELL GEOLOGISK FLYFOTOTOLKNING AV SVART/HVIT-BILDER	MÅLESTOKK 1:10 000	OBS.	
		TEGN.	
		TRAC. PR	AUG 1974
		KFR.	SEPT 1974
NORGES GEOLOGISKE UNDERSØKELSE TRONDHEIM	TEGNING NR. 1173B-03	KARTBLAD NR. 1331 I	

1173 B-03

ARNESHESTEN

0y
1154400x

6400y
1154400x

OFOTFJORD

ARNES

RÅNA

Rånbogen

STØVELHØLA

Rånelva

Kringelvann

STORVATNET

ARNESHESTEN

Bruvann
421.3

Kalkhaugen

Mor

1149600x
0y

1149600x
6400y

TEGNFORKLARING:

P	PERIDOTITT
N, Nm	NORITT
K.N	KVARTS-NORITT
Peg	PEGMATITT
G, G_1, G_2	GNEIS
Ks	KALKSILIKATBERGART
A	AMFIBOLITT
Gr	SURE INTRUSIVBERGARTER
Im	MASSIVE BERGARTER
Al	ALLUVIALAVSETNINGER
Ter	TERRASSE
Mor	MORENE

	MORENERYGG ELLER ESKER
K	UNDERLIGGENDE BERGART > 50% DEKKET MED KVARTÆRAVSETNINGER OG VEGETASJON
	BERGARTSGRENSE
	GRENSE FOR KVARTÆRAVSETNINGER OG ISBREER
	BRUDDSONE ELLER STØRRE SPREKK
	MINDRE BRUDDSONE ELLER SPREKK
	STRUKTURER SOM BÅNDING, SKIFRIGHET O.S.V.
	SKIFRIGHET, FALL < 30°
	—II— --II— 30°-50°
	—II— --II— 50°-80°
	—II— VERTIKAL
	SKRENT

OVERSIKT OVER KARTSERIEN:

		SALTVIKFJELL
	ARNES-HESTEN	RÅNKJEIPEN
	SEPMOL-FJELL	TVERRFJELL

RÅNA – 1:10.000 E-O 240/241

STAVANGER STAAL A/S

Konstruksjon: FJELLANGER/WIDERØE

Reprografi: Norges geologiske undersøkelse

STAVANGER STAAL A/S **RÅNAUNDERSØKELSENE 1973** STRUKTURELL GEOLOGISK FLYFOTOTOLKNING AV INFRARØD-BILDER	MÅLESTOKK 1:10000	OBS.	
		TEGN.	
		TRAC. PR.	OKT. 1974
		KFR.	NOV. 1974
NORGES GEOLOGISKE UNDERSØKELSE TRONDHEIM	TEGNING NR. 1173B-04	KARTBLAD NR. 1331 I	

1173 B-04

SEPMOLFJELL

TEGNFORKLARING:

P	PERIDOTITT
N	NORITT
K.N	KVARTS-NORITT
Peg	PEGMATITT
G	GNEIS
Ks	KALKSILIKATBERGART
A	AMFIBOLITT
Gr	SURE INTRUSIVBERGARTER
m	MASSIVE BERGARTER
Al	ALLUVIALAVSETNINGER
Ter	TERRASSE
Mor	MORENE

	MORENERYGG
K	UNDERLIGGENDE BERGART >50% DEKKET MED KVARTÆRAVSETNINGER OG VEGETASJON
	BERGARTSGRENSE
	GRENSE FOR KVARTÆRAVSETNINGER OG ISBREER
	BRUDDSONE ELLER STØRRE SPREKK
	MINDRE BRUDDSONE ELLER SPREKK
	STRUKTURER SOM BÅNDING, SKIFRIGHET O.S.V.
	SKIFRIGHET, FALL < 30°
	—II— —II— 30°-50°
	—II— —II— 50°-80°
	—II— VERTIKAL
	SKRENT

OVERSIKT OVER KARTSERIEN:

	SALTVIKFJELL
ARNES-HESTEN	RÅNKJEIPEN
SEPMOL-FJELL	TVERRFJELL

RÅNA – 1:10.000 E-O-239/240

STAVANGER STAAL A/S

Konstruksjon: FJELLANGER/WIDERØE

Reprografi: Norges geologiske undersøkelse

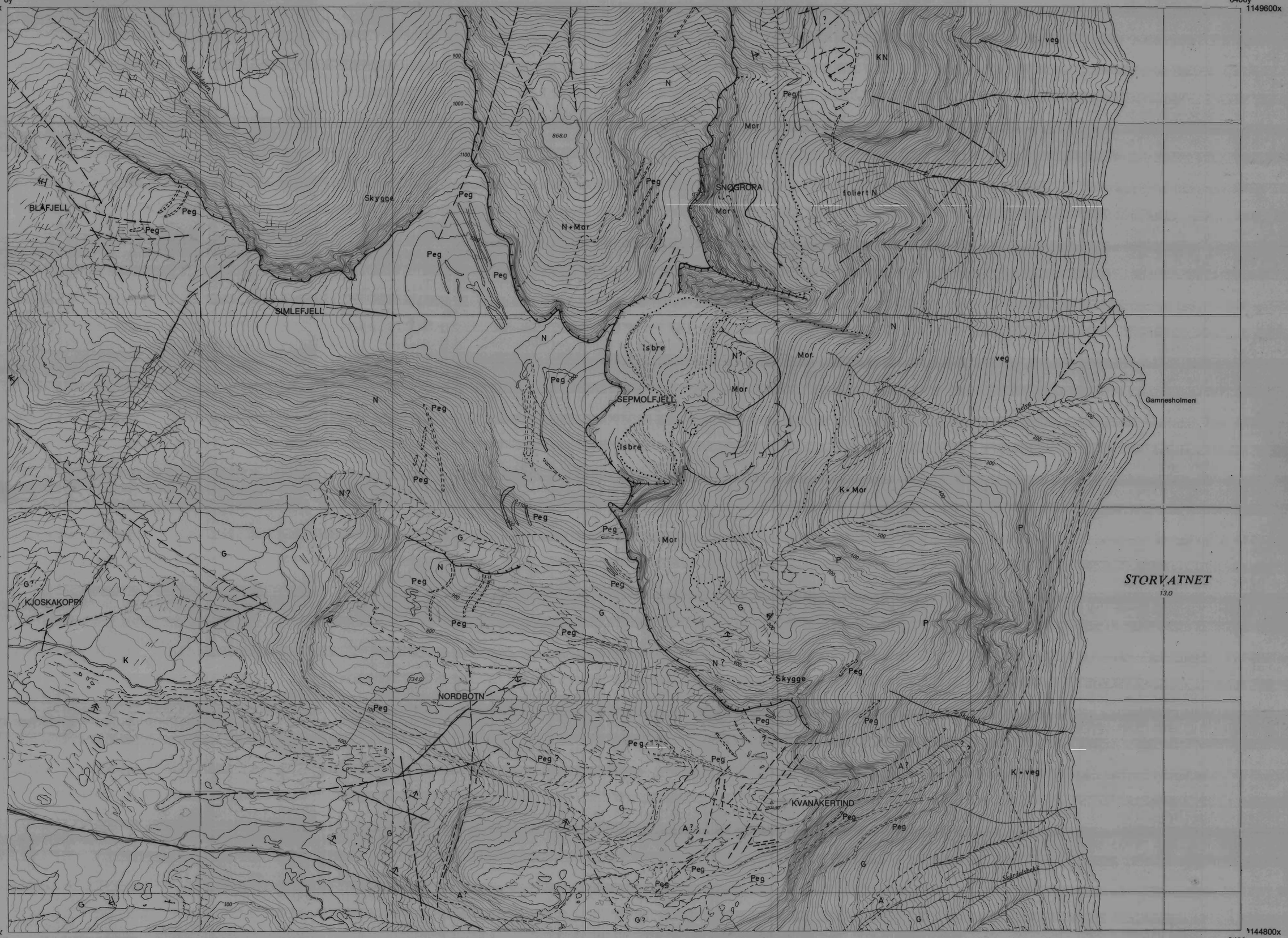
STAVANGER STAAL A/S	MÅLESTOKK	OBS.	
RÅNAUNDERSØKELSENE 1973		TEGN.	
STRUKTURELL GEOLOGISK FLYFOTOTOLKNING AV FARGE-BILDER	1:10 000	TRAC. PR.	OKT. 1974
		KFR.	NOV. 1974
NORGES GEOLOGISKE UNDERSØKELSE TRONDHEIM	TEGNING NR. 1173 B - 05		KARTBLAD NR. 1331 I

1133 B-02

SEPMOLFJELL

0y 1149600x — 6400y 1149600x

1144800x 0y — 1144800x 6400y



TEGNFORKLARING:

P	PERIDOTITT
N	NORITT
K.N	KVARTS-NORITT
Peg	PEGMATITT
G	GNEIS
Ks	KALKSILIKATBERGART
A	AMFIBOLITT
Gr	SURE INTRUSIVBERGARTER
m	MASSIVE BERGARTER
Al	ALLUVIALAVSETNINGER
Ter	TERRASSE
Mor	MORENE

	MORENERYGG
K	UNDERLIGGENDE BERGART > 50 % DEKKET MED KVARTÆRAVSETNINGER OG VEGETASJON
	BERGARTSGRENSE
	GRENSE FOR KVARTÆRAVSETNINGER OG ISBREER
	BRUDDSONE ELLER STØRRE SPREKK
	MINDRE BRUDDSONE ELLER SPREKK
	STRUKTURER SOM BÅNDING, SKIFRIGHET O.S.V.
	SKIFRIGHET, FALL < 30°
	—"— —"— 30°- 50°
	—"— —"— 50°- 80°
	—"— VERTIKAL
	SKRENT

OVERSIKT OVER KARTSERIEN:

	SALTVIKFJELL	
ARNES-HESTEN	RÅNKJEIPEN	
SEPMOL-FJELL	TVERRFJELL	

RÅNA – 1:10.000 E-O 239/240

STAVANGER STAAL A/S

Konstruksjon: FJELLANGER/WIDERØE

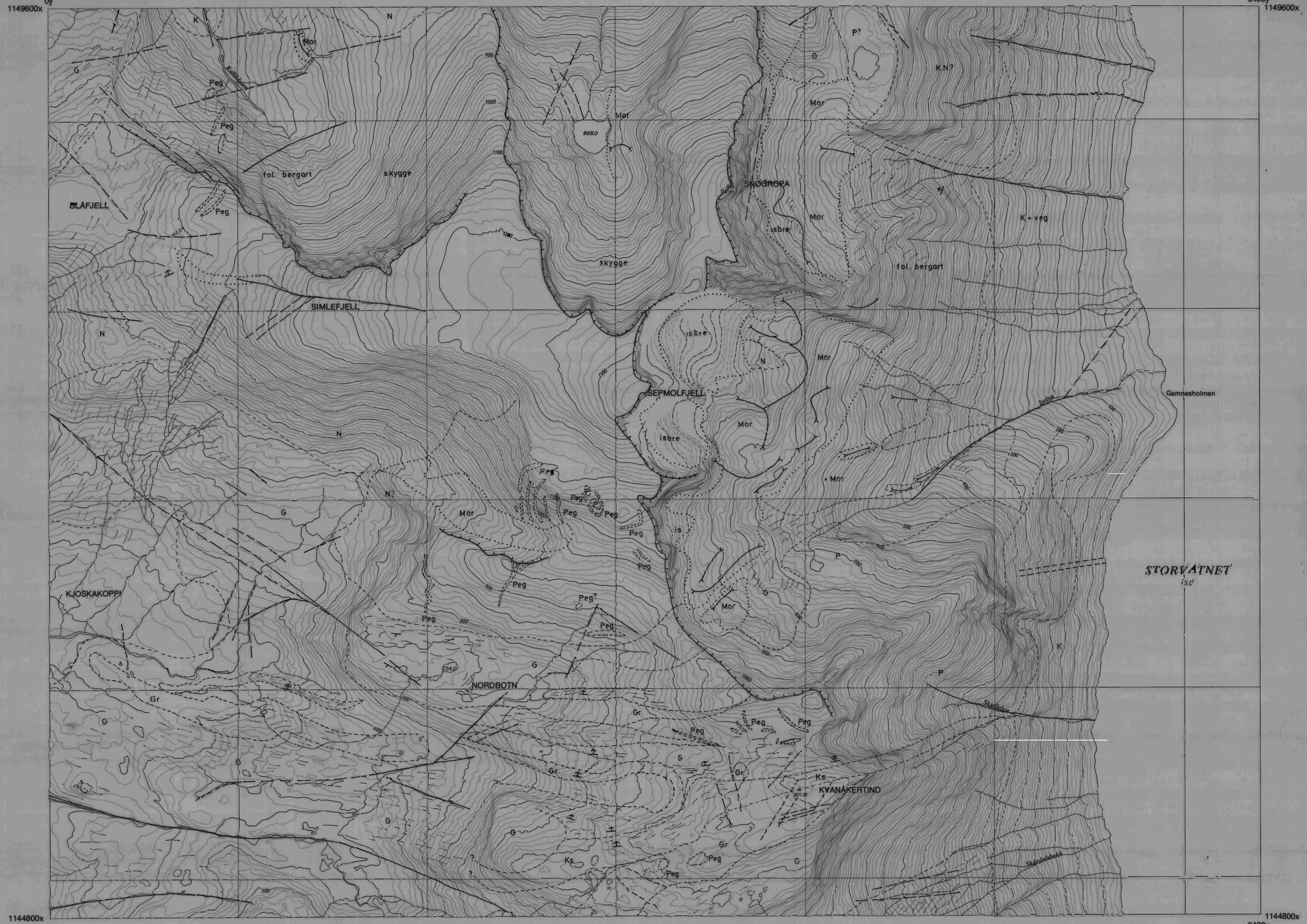
Reprografi: Norges geologiske undersøkelse

STAVANGER STAAL A/S RÅNAUNDERSØKELSENE 1973 STRUKTURELL GEOLOGISK FLYFOTOTOLKNING AV SVART/HVIT-BILDER	MÅLESTOKK 1:10 000	OBS.	
		TEGN.	
		TRAC. PR	AUG 1974
		KFR.	SEPT 1974
NORGES GEOLOGISKE UNDERSØKELSE TRONDHEIM	TEGNING NR. 1173B-06	KARTBLAD NR. 1331 I	

1133 B-06

SEPMOLFJELL

0y 1149600x — 6400y 1149600x



1144800x 0y — 1144800x 6400y

RÅNA – 1:10.000 E-O 239/240

STAVANGER STAAL A/S

Konstruksjon: FJELLANGER/WIDERØE

Reprografi: Norges geologiske undersøkelse

TEGNFORKLARING:

P	PERIDOTITT
N	NORITT
K.N	KVARTS-NORITT
Peg	PEGMATITT
G	GNEIS
Ks	KALKSILIKATBERGART
A	AMFIBOLITT
Gr	SURE INTRUSIVBERGARTER
m	MASSIVE BERGARTER
Al	ALLUVIALAVSETNINGER
Ter	TERRASSE
Mor	MORENE

	MORENERYGG
K	UNDERLIGGENDE BERGART > 50% DEKKET MED KVARTÆRAVSETNINGER OG VEGETASJON
	BERGARTSGRENSE
	GRENSE FOR KVARTÆRAVSETNINGER OG ISBREER
	BRUDDSONE ELLER STØRRE SPREKK
	MINDRE BRUDDSONE ELLER SPREKK
	STRUKTURER SOM BÅNDING, SKIFRIGHET O.S.V.
	SKIFRIGHET, FALL < 30°
	—"— —"— 30°-50°
	—"— —"— 50°-80°
	—"— VERTIKAL
	SKRENT

OVERSIKT OVER KARTSERIEN:

	SALTVIKFJELL	
ARNES-HESTEN	RÅNKJEIPEN	
SEPMOL-FJELL	TVERRFJELL	

STAVANGER STAAL A/S

RÅNAUNDERSØKELSENE 1973

STRUKTURELL GEOLOGISK FLYFOTOTOLKNING AV INFRARØD-BILDER

NORGES GEOLOGISKE UNDERSØKELSE TRONDHEIM

MÅLESTOKK 1:10 000	OBS.		
	TEGN.		
	TRAC. P.R.	OKT 1974	
	KFR.	NOV 1974	
TEGNING NR. 1173B - 07		KARTBLAD NR. 1331 I	

1173B-07

SALTVIKFJELL

6400y
1159200x

15400y
1159200x

OFOTFJORD

VIREK

RØSÅSEN

SKJOMEN

SKJOMENBRUA

SALTVIK

Saltvikneset

SALTVIKRYGGEN

HAMMERFJELL

1154400x
6400y

15400y

TEGNFORKLARING:

P	PERIDOTITT		MORENERYGG ELLER ESKER
N, Nm	NORITT	K	UNDERLIGGENDE BERGART > 50% DEKKET MED KVARTÆRAVSETNINGER OG VEGETASJON
K.N	KVARTS-NORITT		BERGARTSGRENSE
Peg	PEGMATITT		GRENSE FOR KVARTÆRAVSETNINGER OG ISBREER
G C_1 G_2	GNEIS		BRUDDSONE ELLER STØRRE SPREKK
Ks	KALKSILIKATBERGART		MINDRE BRUDDSONE ELLER SPREKK
A	AMFIBOLITT		STRUKTURER SOM BÅNDING, SKIFRIGHET O.S.V.
Gr	SURE INTRUSIVBERGARTER		SKIFRIGHET, FALL < 30°
m	MASSIVE BERGARTER		—II— —II— 30°-50°
Al	ALLUVIALAVSETNINGER		—II— —II— 50°-80°
Ter	TERRASSE		—II— VERTIKAL
Mor	MORENE		SKRENT

RÅNA - 1:10.000 E-P/Q-241/242

STAVANGER STAAL A/S

Konstruksjon: FJELLANGER/WIDERØE

Fotografi: Norges geologiske undersøkelse

OVERSIKT OVER KARTSERIEN:

	SALTVIKFJELL	
ARNES-HESTEN	RÅNKJEIPEN	
SEPMOL-FJELL	TVERRFJELL	

STAVANGER STAAL A/S

RÅNAUNDERSØKELSENE 1973

STRUKTURELL GEOLOGISK FLYFOTOTOLKNING AV FARGE-BILDER

MÅLESTOKK 1:10000

TRAC. PR. OKT. 1974
TEGN.
KFR. NOV. 1974

NORGES GEOLOGISKE UNDERSØKELSE
TRONDHEIM

TONINGS NR. 1173B-08

KORTBLAD NR. 1331 I

1173 B-08

SALTVIKFJELL

6400y
1159200x

15400y
1159200x

OFOTFJORD

VIREK

Saltvikneset

RØSÅSEN

SALTVIK

SKJOMEN

SKJOMENBRUA

SALTVIKRYGGEN

K = veg

HAMMERFJELL

1154400x
6400y

1154400x
15400y

TEGNFORKLARING:

P	PERIDOTITT		MORENERYGG ELLER ESKER
N, Nm	NORITT	K	UNDERLIGGENDE BERGART > 50% DEKKET MED KVARTÆRAVSETNINGER OG VEGETASJON
K.N	KVARTS-NORITT		BERGARTSGRENSE
Peg	PEGMATITT		GRENSE FOR KVARTÆRAVSETNINGER OG ISBREER
$G, G_1 G_2$	GNEIS		BRUDDSONE ELLER STØRRE SPREKK
Ks	KALKSILIKATBERGART		MINDRE BRUDDSONE ELLER SPREKK
A	AMFIBOLITT		STRUKTURER SOM BÅNDING, SKIFRIGHET O.S.V.
Gr	SURE INTRUSIVBERGARTER		SKIFRIGHET, FALL < 30°
m	MASSIVE BERGARTER		—"— —"— 30°-50°
Al	ALLUVIALAVSETNINGER		—"— —"— 50°-80°
Ter	TERRASSE		—"— VERTIKAL
Mor	MORENE		SKRENT

RÅNA – 1:10.000 E-P/Q·241/242

STAVANGER STAAL A/S

Konstruksjon: FJELLANGER/WIDERØE

Reprografi: Norges geologiske undersøkelse

OVERSIKT OVER KARTSERIEN:

	SALTVIKFJELL	
ARNESHESTEN	RÅNKJEIPEN	
SEPMOLFJELL	TVERRFJELL	

STAVANGER STAAL A/S

RÅNAUNDERSØKELSENE 1973

STRUKTURELL GEOLOGISK FLYFOTOTOLKNING AV SVART/HVIT-BILDER

MÅLESTOKK	OBS.		
1:10 000	TEGN.		
	TRAC. PR	AUG 1974	
	KFR.	SEPT 1974	

NORGES GEOLOGISKE UNDERSØKELSE
TRONDHEIM

TEGNING NR.	KARTBLAD NR.
1173B-09	1331 I

1173 B-09

SALTVIKFJELL

6400y
1159200x

15400y
1159200x

OFOTFJORD

VIREK

Saltvikneset

RØSÅSEN

SKJOMEN

SKJOMENBRUA

SALTVIK

SALTVIKRYGGEN

HAMMERFJELL

K-veg

1154400x
6400y

1154400x
15400y

TEGNFORKLARING:

P	PERIDOTITT
N, Nm	NORITT
K,N	KVARTS-NORITT
Peg	PEGMATITT
$G_1 G_2 G_3$	GNEIS
Ks	KALKSILIKATBERGART
A	AMFIBOLITT
Gr	SURE INTRUSIVBERGARTER
m	MASSIVE BERGARTER
Al	ALLUVIALAVSETNINGER
Ter	TERRASSE
Mor	MORENE

	MORENERYGG ELLER ESKER
K	UNDERLIGGENDE BERGART > 50% DEKKET MED KVARTÆRAVSETNINGER OG VEGETASJON
	BERGARTSGRENSE
	GRENSE FOR KVARTÆRAVSETNINGER OG ISBRÆER
	BRUDDSONE ELLER STØRRE SPREKK
	MINDRE BRUDDSONE ELLER SPREKK
	STRUKTURER SOM BÅNDING, SKIFRIGHET O.S.V.
	SKIFRIGHET, FALL < 30°
	—II— —II— 30°-50°
	—II— —II— 50°-80°
	—II— VERTIKAL
	SKRENT

RÅNA – 1:10.000 E-P/Q·241/242

STAVANGER STAAL A/S

Kontaktkopi: FJELLANGER/WIDERØE

Reprografi: Norges geologiske undersøkelse

OVERSIKT OVER KARTSERIEN:

	SALTVIKFJELL
ARNES-HESTEN	RÅNKJEIPEN
SEPMOL-FJELL	TVERRFJELL

STAVANGER STAAL A/S

RÅNAUNDERSØKELSENE 1973

STRUKTURELL GEOLOGISK FLYFOTOTOLKNING AV INFRARØD-BILDER

NORGES GEOLOGISKE UNDERSØKELSE
TRONDHEIM

MÅLESTOKK	OBS.		
1:10 000	TEGN.		
	TRAC. ÅR.	OKT. 1974	
	KFR.	NOV. 1974	
TEGNING NR.		KARTBLAD NR.	
1173B-10		1331 I	

1173B-10

RÅNKJEIPEN

6400y
1154400x
15400y
1154400x

Saltvikvann 418
Råntindvann 735
Tverrfjellsetra
HAMMERFJELL
RÅNKJEIPEN
RØDEJELL
TVERRFJELL
SKJOMEN
STORVATNET 13
Skygge
esker
esker
forlert bergart
forsifret
1149600x
6400y
1149600x
15400y

TEGNFORKLARING:

P	PERIDOTITT
N, Nm	NORITT
K.N	KVARTS-NORITT
Peg	PEGMATITT
G, ⁻G, +G	GNEIS
Ks	KALKSILIKATBERGART
A	AMFIBOLITT
Gr	SURE INNTRUSIVBERGARTER
m	MASSIVE BERGARTER
Al	ALLUVIALAVSETNINGER
Ter	TERRASSE
Mor	MORENE

	MORENERYGG ELLER ESKER
K	UNDERLIGGENDE BERGART > 30 %, DEKKET MED KVARTÆRAVSETNINGER OG VEGETASJON
	BERGARTSGRENSE
	GRENSE FOR KVARTÆRAVSETNINGER OG ISBREER
	BRUDDSONE ELLER STØRRE SPREKK
	MINDRE BRUDDSONE ELLER SPREKK
	STRUKTURER SOM BÅNDING, SKIFRIGHET O.S.V.
	SKIFRIGHET, FALL < 30°
	—II— —II— 30°-50°
	—II— —II— 50°-80°
	—II— VERTIKAL
	SKRENT

RÅNA – 1:10.000 E-P/Q·240/241

STAVANGER STAAL A/S

Konstruksjon: KJELLANDER/MOKKELBOST
Fotografi: Norges geologiske undersøkelse

OVERSIKT OVER KARTSERIEN:

	SALTVIKFJELL	
ARNESVATNET	RÅNKJEIPEN	
SEPMOLFJELL	TVERRFJELL	

STAVANGER STAAL A/S
RÅNAUNDERSØKELSENE 1973
STRUKTURELL GEOLOGISK FLYFOTOTOLKNING
AV FAROFÆLDER

MÅLESTOKK 1:10 000	OBS.		
	TEGN.		
	TRAC. PR	ØKT. LN.	
	KFR.	NOV. 1974	

NORGES GEOLOGISKE UNDERSØKELSE
TRONDHEIM

TEGNING NR.	KARTBLAD NR.
1173B-11	1331 I

1173 B-11

RÅNKJEIPEN

TEGNFORKLARING:

P	PERIDOTITT
N, Nm	NORITT
K.N	KVARTS-NORITT
Peg	PEGMATITT
G, G_1, G_2	GNEIS
Ks	KALKSILIKATBERGART
A	AMFIBOLITT
Gr	SURE INTRUSIVBERGARTER
m	MASSIVE BERGARTER
Al	ALLUVIALAVSETNINGER
Ter	TERRASSE
Mor	MORENE

	MORENERYGG ELLER ESKER
K	UNDERLIGGENDE BERGART > 50% DEKKET MED KVARTÆRAVSETNINGER OG VEGETASJON
	BERGARTSGRENSE
	GRENSE FOR KVARTÆRAVSETNINGER OG SBREER
	BRUDDSONE ELLER STØRRE SPREKK
	MINDRE BRUDDSONE ELLER SPREKK
	STRUKTURER SOM BÅNDING, SKIFRIGHET O.S.V.
	SKIFRIGHET, FALL < 30°
	30°–50°
	50°–80°
	VERTIKAL
	SKRENT

RÅNA – 1:10.000 E-P/Q·240/241

STAVANGER STAAL A/S

Konstruksjon: FJELLANGER/WIDERØE

Reprografi: Norges geologiske undersøkelse

OVERSIKT OVER KARTSERIEN:

	SALTVIKFJELL
ARNES-HESTEN	RÅNKJEIPEN
SEPMOL-FJELL	TVERRFJELL

STAVANGER STAAL A/S

RÅNAUNDERSØKELSENE 1973

STRUKTURELL GEOLOGISK FLYFOTOTOLKNING AV SVART/HVIT-BILDER

NORGES GEOLOGISKE UNDERSØKELSE TRONDHEIM

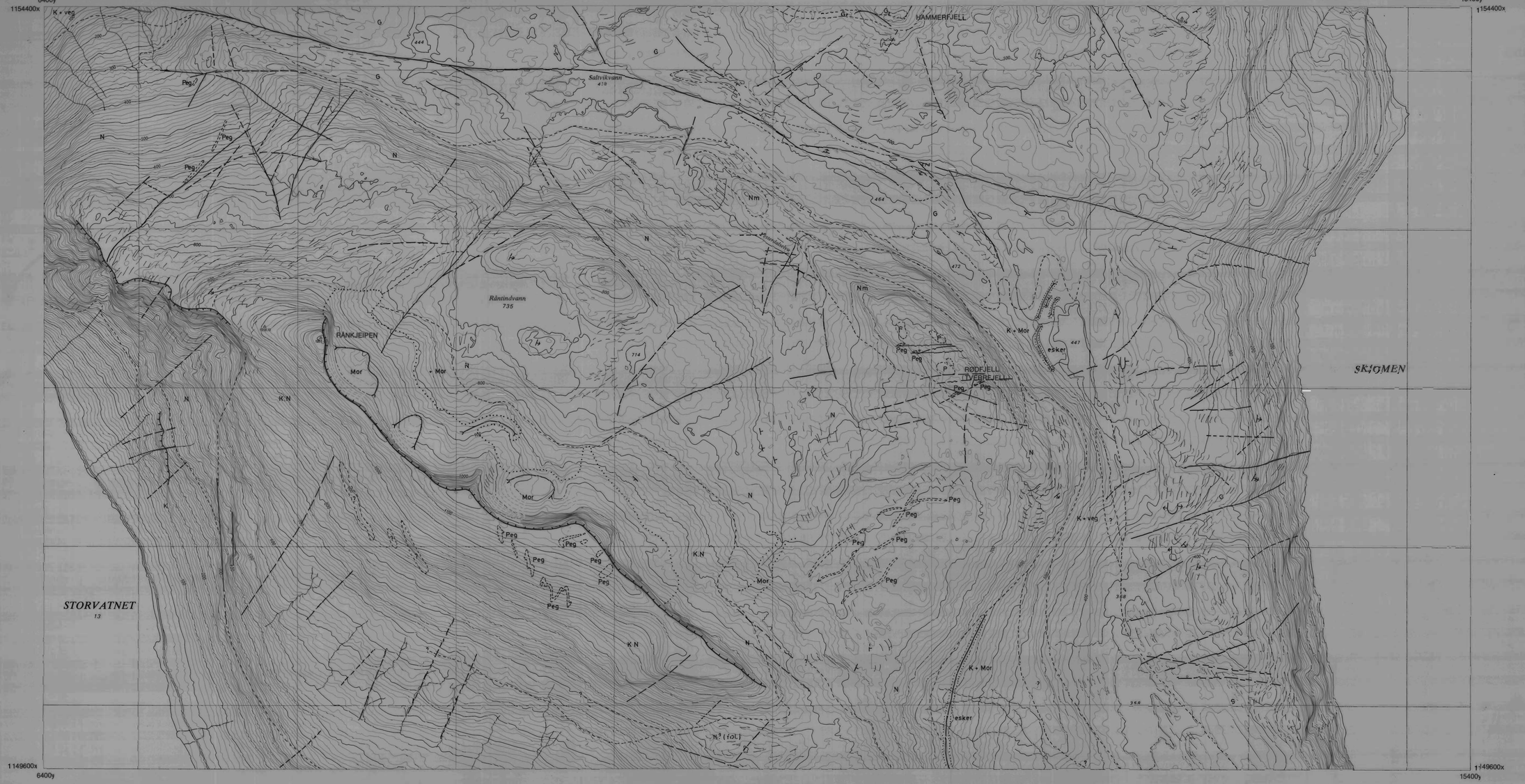
MÅLESTOKK			
1:10 000	OBS.		
	TEGN.		
	TRAC.	P.R.	OKT. 1974
	KFR.		NOV. 1974

TEGNING NR.	KARTBLAD NR.
1173B-15/2	1331 I

1153 B-15

RÅNKJEIPEN

6400y
1154400x
15400y
1154400x



1149600x
6400y
1149600x
15400y

TEGNFORKLARING:

P	PERIDOTITT
N, Nm	NORITT
K.N	KVARTS-NORITT
Peg	PEGMATITT
G, G_1, G_2	GNEIS
Ks	KALKSILIKATBERGART
A	AMFIBOLITT
Gt	SURE INTRUSIVBERGARTER
m	MASSIVE BERGARTER
Al	ALLUVIALAVSETNINGER
Ter	TERRASSE
Mor	MORENE

- MORENERYGG ELLER ESKER
- K — UNDERLIGGENDE BERGART > 50% DEKKET MED KVARTÆRAVSETNINGER OG VEGETASJON
- BERGARTSGRENSE
- GRENSE FOR KVARTÆRAVSETNINGER OG ISBREER
- BRUDDSONE ELLER STØRRE SPREKK
- MINDRE BRUDDSONE ELLER SPREKK
- STRUKTURER SOM BÅNDING, SKIFRIGHET O.S.V.
- SKIFRIGHET, FALL < 30°
- —II— —II— 30°-50°
- —II— —II— 50°-80°
- —II— VERTIKAL
- SKRENT

RÅNA – 1:10.000 E-P/Q·240/241

STAVANGER STAAL A/S

Konstruksjon: FJELLANGER/WIDERØE
Petrografi: Petrografiske undersøkelser

OVERSIKT OVER KARTSERIEN:

	SALTVIKFJELL
ARNESHESTEN	RÅNKJEIPEN
SEPMOFJELL	TVERRFJELL

STAVANGER STAAL A/S
RÅNAUNDERSØKELSENE 1973
STRUKTURELL GEOLOGISK KARTLEGGING
AV INFRARØD-BILDER

MÅLESTOKK	1:10 000
OBS.	
TEGN.	
TRAC. PR.	OKT. 1974
KFR.	NOV. 1974

NORGES GEOLOGISKE UNDERSØKELSE
TRONDHEIM

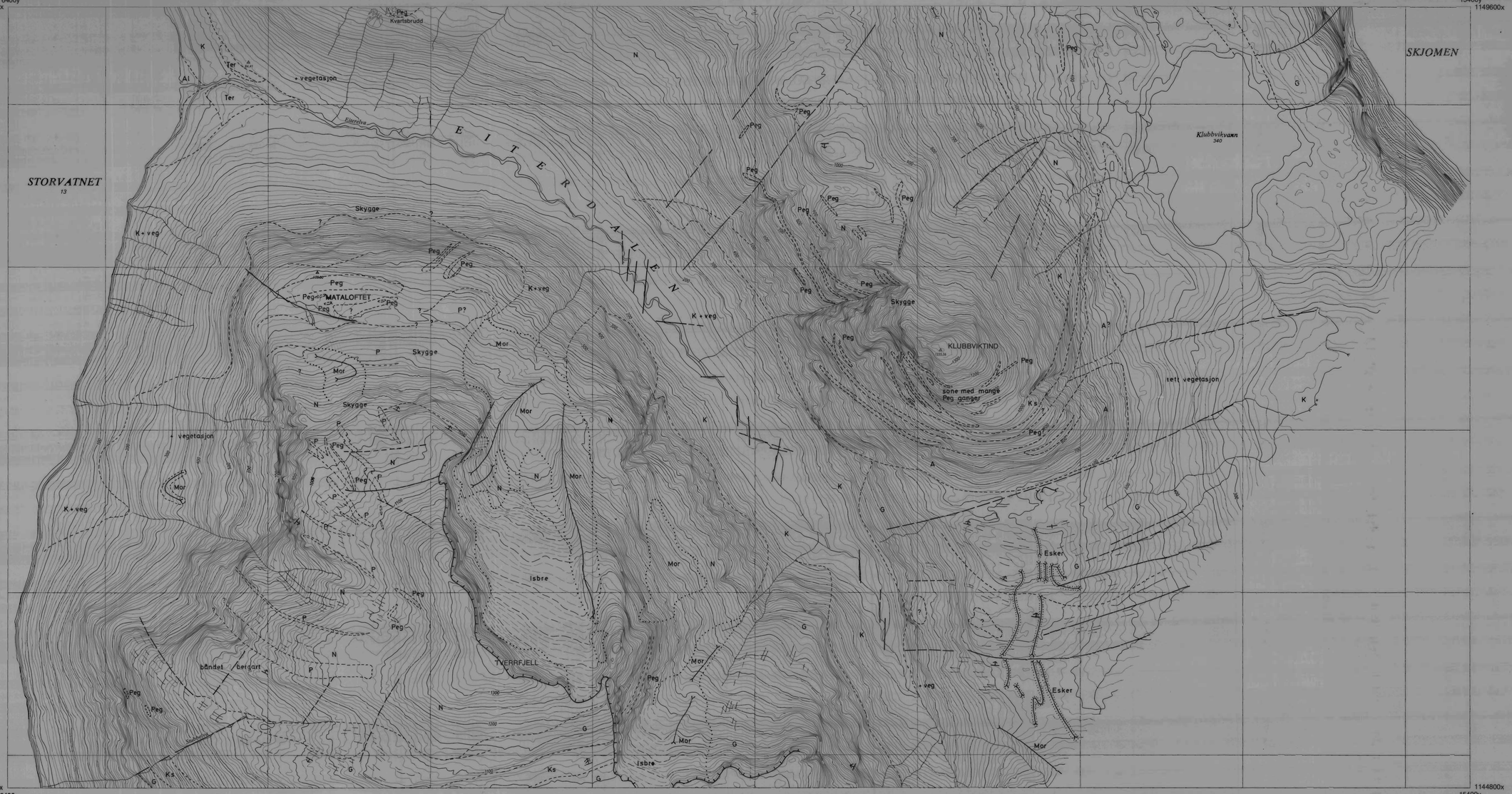
TEGNING NR.	KARTBLAD NR.
1173 B - 13	1331 I

1133 B-13

TVERRFJELL

6400y
1149600x

15400y
1149600x



TEGNFORKLARING:

P	PERIDOTITT		MORENERYGG ELLER ESKER
N	NORITT	K	UNDERLIGGENDE BERGART > 50% DEKKET MED KVARTÆRAVSETNINGER OG VEGETASJON
K.N	KVARTS-NORITT		BERGARTSGRENSE
Peg	PEGMATITT		GRENSE FOR KVARTÆRAVSETNINGER OG ISBREER
G	GNEIS		BRUDDSONE ELLER STØRRE SPREKK
Ks	KALKSILIKATBERGART		MINDRE BRUDDSONE ELLER SPREKK
A	AMFIBOLITT		STRUKTURER SOM BÅNDING, SKIFRIGHET O.S.V.
Gr	SURE INTRUSIVBERGARTER		SKIFRIGHET, FALL < 30°
m	MASSIVE BERGARTER		—"— —"— 30°-50°
Al	ALLUVIALAVSETNINGER		—"— —"— 50°-80°
Ter	TERRASSE		—"— —"— VERTIKAL
Mor	MORENE		SKRENT

RÅNA – 1:10.000 E-P/Q·239/240

STAVANGER STAAL A/S

Konstruksjon: FJELLANGER-WIDERØE

Reprografi: Norges geologiske undersøkelse

OVERSIKT OVER KARTSERIEN:

	SALTVIKFJELL	
ARNES-HESTEN	RÅNKJEIPEN	
SEIPMOL-FJELL	TVERRFJELL	

STAVANGER STAAL A/S

RÅNAUNDERSØKELSENE 1973

STRUKTURELL GEOLOGISK FLYFOTOTOLKNING AV FARGE-BILDER

MÅLESTOKK	OBS.	
1:10 000	TEGN.	
	TRAC. PR.	OKT. 1974
	KFR.	NOV. 1974

NORGES GEOLOGISKE UNDERSØKELSE
TRONDHEIM

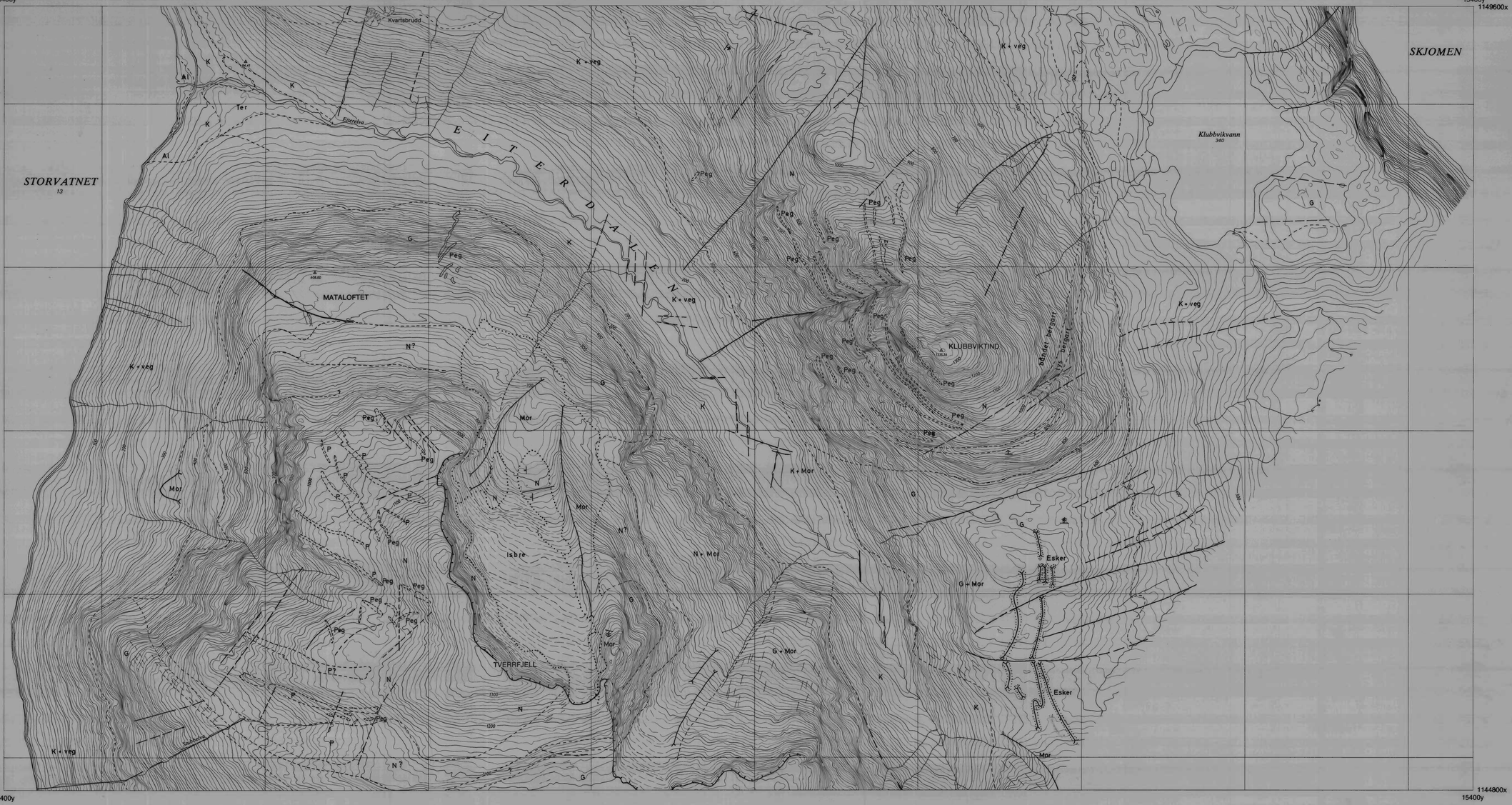
TEGNING NR.	KARTBLAD NR.
1173B-14	1331 I

1133B-14

TVERRFJELL

6400y
1149600x

15400y
1149600x



1144800x
6400y

1144800x
15400y

TEGNFORKLARING:

P	PERIDOTITT		MORENERYGG ELLER ESKER
N	NORITT	K	UNDERLIGGENDE BERGART > 50% DEKKET MED KVARTÆRAVSETNINGER OG VEGETASJON
K.N	KVARTS-NORITT		BERGARTSGRENSE
Peg	PEGMATITT		GRENSE FOR KVARTÆRAVSETNINGER OG ISBREER
G	GNEIS		BRUDDSONE ELLER STØRRE SPREKK
Ks	KALKSILIKATBERGART		MINDRE BRUDDSONE ELLER SPREKK
A	AMFIBOLITT		STRUKTURER SOM BÅNDING, SKIFRIGHET O.S.V.
Gr	SURE INTRUSIVBERGARTER		SKIFRIGHET, FALL < 30°
m	MASSIVE BERGARTER		—"— —"— 30°-50°
Al	ALLUVIALAVSETNINGER		—"— —"— 50°-80°
Ter	TERRASSE		—"— VERTIKAL
Mor	MORENE		SKRENT

RÅNA – 1:10.000 E-P/Q·239/240

STAVANGER STAAL A/S

Konstruksjon: FJELLANGER/WIDERØE
Reprografi: Norges geologiske undersøkelse

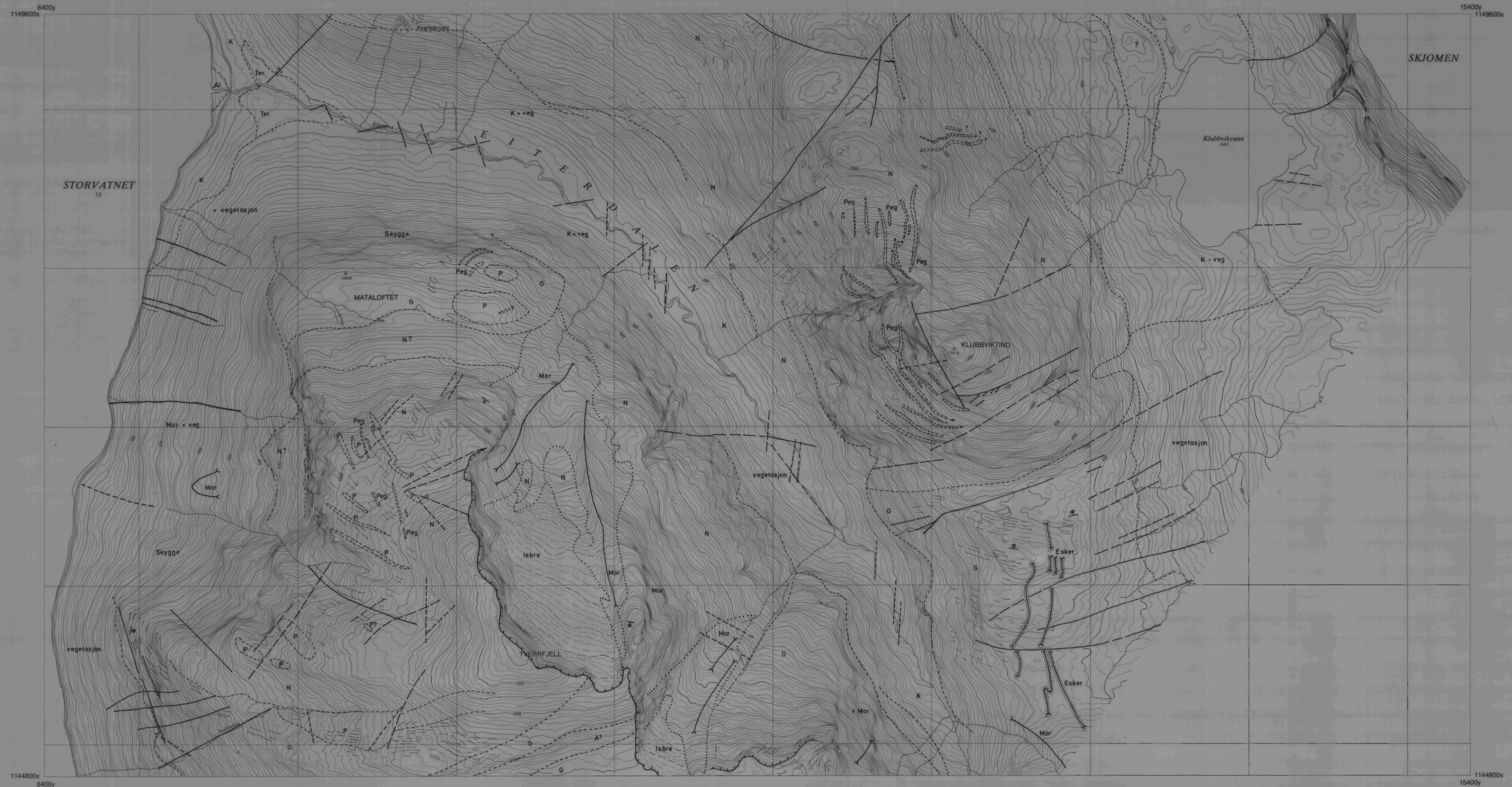
OVERSIKT OVER KARTSERIEN:

	SALTVIKFJELL	
ARNES-HESTEN	RÅNKJEIPEN	
SEPMOL-FJELL	TVERRFJELL	

STAVANGER STAAL A/S	MÅLESTOKK	OBS.	
RÅNAUNDERSØKELSENE 1973	1:10 000	TEGN.	
STRUKTURELL GEOLOGISK FLYFOTOTOLKNING AV SVART/HVIT-BILDER		TRAC. PR.	OKT. 1974
		KFR.	NOV. 1974
NORGES GEOLOGISKE UNDERSØKELSE TRONDHEIM	TEGNING NR. 1173B-15		KARTBLAD NR. 1331 I

1173B-12

TVERRFJELL



TEGNFORKLARING:

P	PERIDOTITT
N	NORITT
K.N	KVARTS-NORITT
Peg	PEGMATITT
G	GNEIS
Ks	KALKSILIKATBERGART
A	AMFIBOLITT
Gr	SURE INTRUSIVBERGARTER
m	MASSIVE BERGARTER
Al	ALLUVIALAVSETNINGER
Ter	TERRASSE
Mor	MORENE

	MORENERYGG ELLER ESKER
K	UNDERLIGGENDE BERGART > 50% DEKKET MED KVARTÆRAVSETNINGER OG VEGETASJON
	BERGARTSGRENSE
	GRENSE FOR KVARTÆRAVSETNINGER OG ISBREER
	BRUDDSONE ELLER STØRRE SPREKK
	MINDRE BRUDDSONE ELLER SPREKK
	STRUKTURER SOM BÅNDING, SKIFRIGHET O.S.V.
	SKIFRIGHET, FALL < 30°
	—"— —"— 30°-50°
	—"— —"— 50°-80°
	—"— VERTIKAL
	SKRENT

RÅNA – 1:10.000 E-P/Q·239/240

STAVANGER STAAL A/S

Konstruksjon: FJELLANGER/WOERNE

Reprografi: Norges geologiske undersøkelse

OVERSIKT OVER KARTSERIEN:

	SALTVIKFJELL	
ARNES-HESTEN	RÅNKJEIPEN	
SEPMOL-FJELL	TVERRFJELL	

STAVANGER STAAL A/S

RÅNAUNDERSØKELSENE 1973

STRUKTURELL GEOLOGISK FLYFOTOTOLKNING AV INFRARØD-BILDER

NORGES GEOLOGISKE UNDERSØKELSE TRONDHEIM

MÅLESTOKK	1:10 000	OBS.	
		TEGN.	
		TRAC. PR.	OKT. 1974
		KFR.	NOV. 1974
TEGNING NR:	1173B-16	KARTBLAD NR.	1331 I

1173B-16